AIR CONDITIONING HEATING AND VENTILATING

MARCH, 1959—56th Year

Modern Bowling Centers Depend on Air Conditioning
See Page 75

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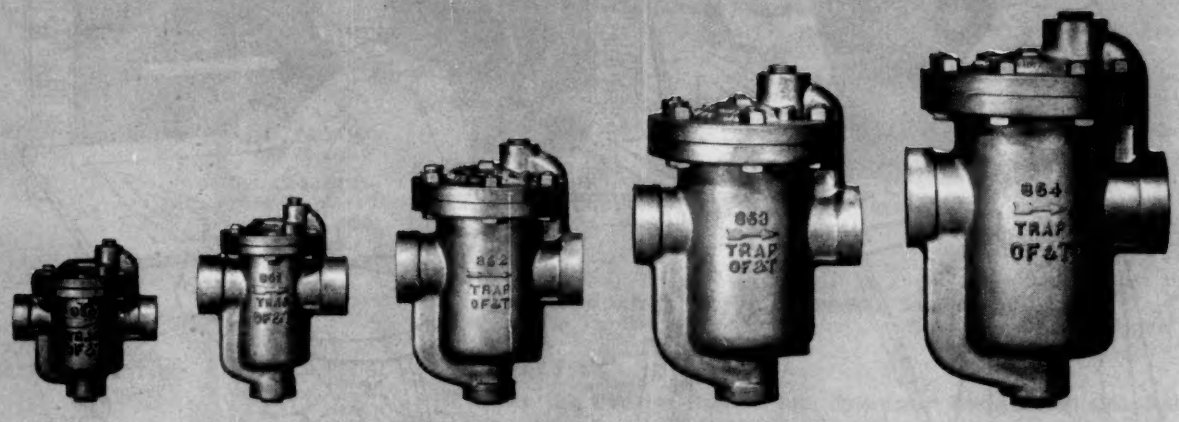

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If a trap with these features is of interest to you, get in touch with your nearby Armstrong Representative. Ask him for Bulletin 775 which gives price, dimension and capacity data, or use the coupon below.

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8466 Maple Street • Three Rivers, Michigan

FREE BULLETIN
No. 775 gives detailed information on Armstrong O.F.&T. traps.

ARMSTRONG MACHINE WORKS
8466 Maple Street, Three Rivers, Michigan

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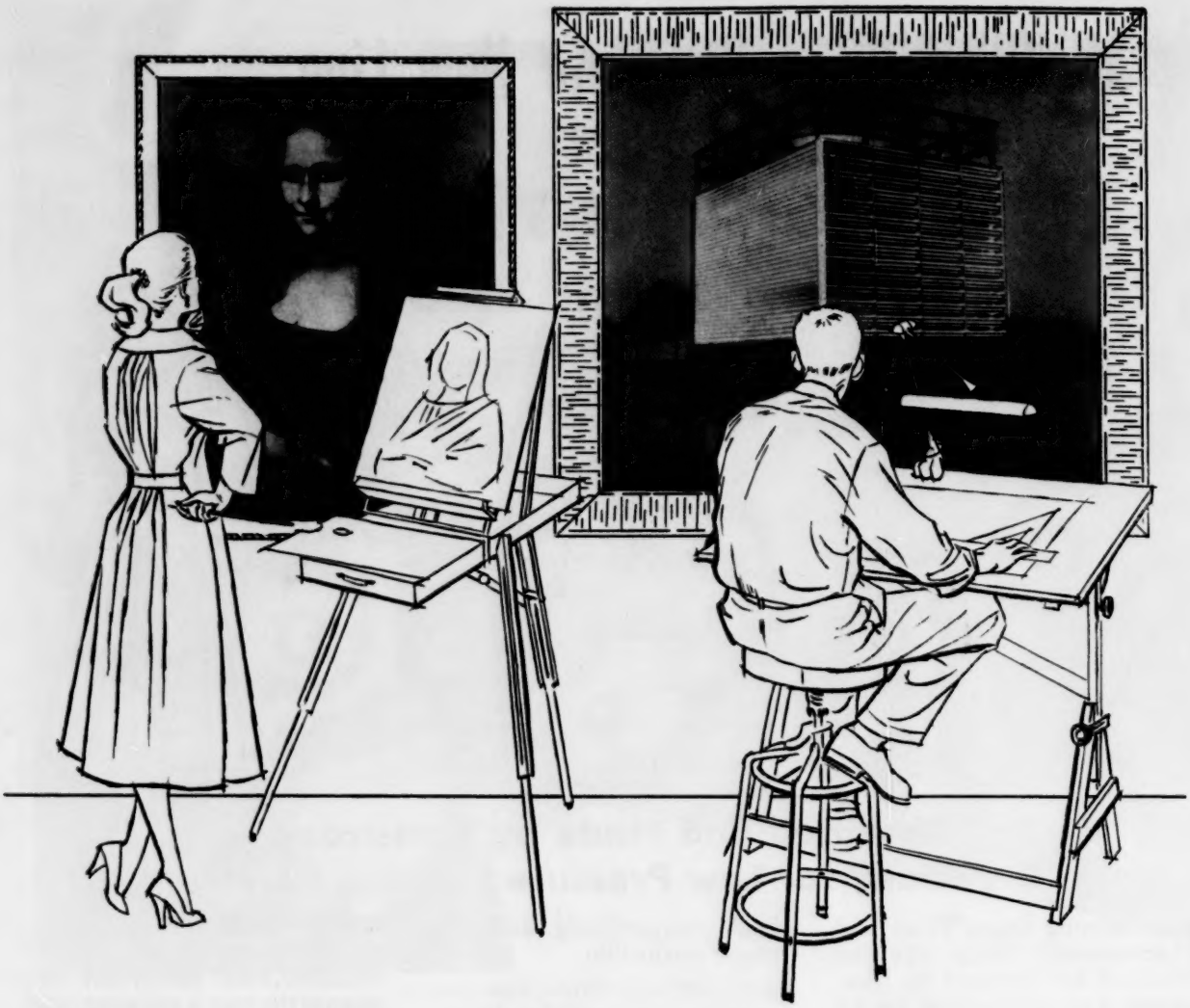

Sincere Acknowledgement of Achievement!

Works of masters of all the arts and sciences are invariably copied—a tribute to the qualities that set them apart, that establish their excellence. A favorite subject of mechanical copyists is the Marley Double-Flow* Cooling Tower . . . but, like the treasures of the art world it is never duplicated.

All the materials that produced the original are available, the perfect model is at hand; yet the depth of understanding expressed by da Vinci, the forceful concentration of Rodin, the performance of Marley towers remain unapproachable. The intangible element that is ever aloof is compounded of the ability to create, years of intense study and practice, and an impelling desire to achieve.

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*REGISTERED TRADE MARK

THE MARLEY CO. MARLEY **KANSAS CITY, MO.**

AIR CONDITIONING HEATING AND VENTILATING

Volume 56, Number 3 **March, 1959**

THE COVER

Bowling is now enjoyed by over 25 million persons. Large alleys, such as the one illustrated, rely on air conditioning to promote business. Photograph, courtesy of AMF Pinspotters, Incorporated.

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HIGH SPOTS

An electric grid buried beneath the surface of its soccer field enabled the Everton soccer team, of Liverpool England, to play its Sunderland rival in January despite the weather. The ground thawed out and the snow melted. The grid is a network of wires. It keeps the soil warm and makes the ground yielding on the coldest days, a soccer official said. Less fortunate clubs had to postpone their matches because of intense cold and snow.

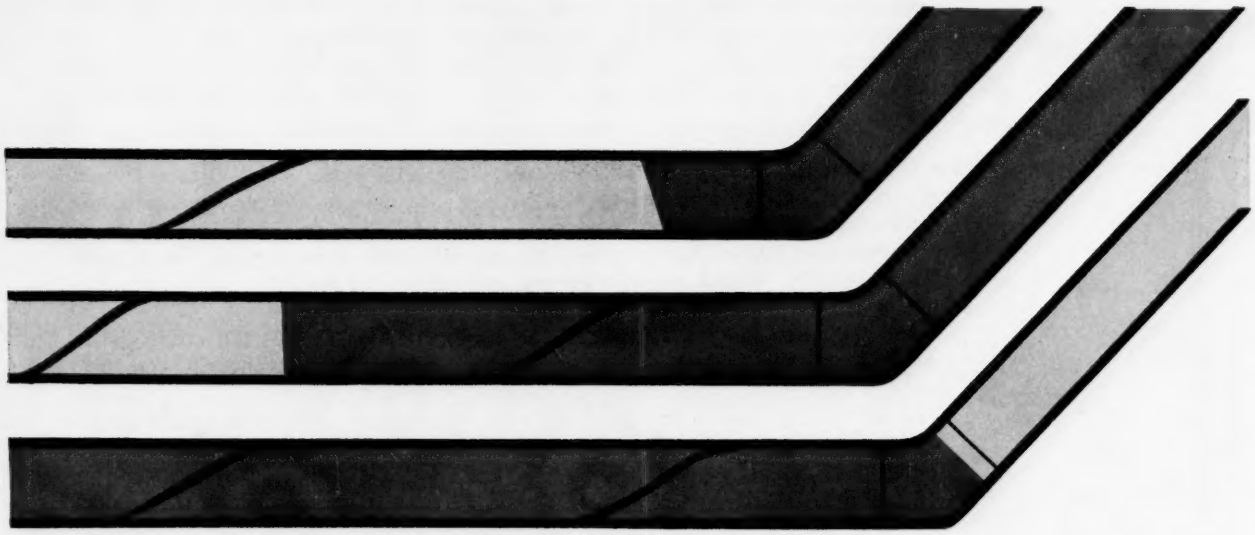
As a contribution to the joint auto industry attack on the Los Angeles smog problem, General Motors Corporation is undertaking a major engineering development and testing program on a technically feasible experimental exhaust control system in an attempt to develop a device that will be commercially acceptable for use on cars and trucks. The experimental system, developed by Dr. Eugene J. Houdry and constructed by Oxy-Catalyst, Inc., consists of an oxidation catalyst contained in the converter. GM Research Laboratories tested a sample of the system over 34,000 miles of city, suburban, country, and proving ground driving. Test results demonstrate that the device promises major reductions in the emission of unburned hydro-carbons, carbon monoxide, and oxides of nitrogen.

Air Conditioning, Heating and Ventilating has been chosen to carry a series of full-page and double-page advertisements in coming months promoting a "Unitary Air-Conditioner Certification Program" launched this year by Air-Conditioning & Refrigeration Institute, Washington, D. C., in cooperation with the National Warm Air Heating and Air Conditioning Association, Cleveland, Ohio. The program already has been subscribed to by 33 leading manufacturers of unitary air-conditioning equipment, better than 80% of the industry. It centers around adoption of ratings based on Btu's to measure cooling capacity, and includes all unitary equipment up to 135,000 Btu capacity, excluding room air-conditioners and heat pumps. An initial ad in this issue focuses on a **Seal of Certification** as a powerful sales tool, and explains the ARI certification program in detail. The ads are part of a comprehensive program launched January 1 to promote the new rating standards and the Seal. In one phase of it, more than 40,000 directories describing the program were sent to members of the air-conditioning industry, specifiers of air-conditioning equipment, and leaders outside the industry.

The Building Research Institute Conference on Building Illumination, Statler-Hilton Hotel, Cleveland, Ohio, May 20-21, will include the reading of three papers on new research in illumination quantity, a demonstration of illumination levels and design trends at the Nela Park Lighting Center, a two-part discussion of electric and natural light utilization, and a session to correlate the recommended levels of illumination with other factors of building design, **including the effects of the recommended new levels on air conditioning design.**

Laurence V. Teesdale, nationally known for his research in cold weather moisture condensation and related problems, has retired from the Forest Products Laboratory of the U.S. Forest Service. His interest in moisture and cold-weather condensation came as he worked with housing, including the construction of his own house in his spare time. During this period he was struck with the similarity between houses and dry kilns. In the wintertime there is heat and moisture inside, and cold temperatures outside. As long as houses were built fairly loosely, there wasn't much of a problem, but during the 1930's builders began to apply weather-stripping and insulation, and to employ slab construction. It was then that Mr. Teasdale's quarter century of research in condensation problems was used to great advantage by manufacturers, architects, engineers and builders.

4-D WROUGHT IRON STEAM RETURN LINES



STEAM CONDENSATE CORROSION: the cause, the effect, and a suggested safeguard

4-D represents the most significant development in the history of wrought iron metallurgy. It was achieved by substantially increasing the deoxidation of the base metal, slightly increasing the phosphorous content and using a more siliceous iron silicate. Result is increased corrosion resistance, improved mechanical and physical properties.

Write for new 4-D Wrought Iron literature and our special report, The Use of Wrought Iron in Steam Condensate Lines. A. M. Byers Company, Clark Building, Pittsburgh 22, Pa.

WHAT CAUSES STEAM CONDENSATE—Steam, losing its heat, turns to moisture as temperature drops below saturation level. This condensate is distilled water, greedy for gases. Any gas in the steam is readily absorbed into this condensate as it cools. The condensate becomes violently corrosive to ordinary piping materials, depending upon the percentage of free CO_2 plus O_2 in the steam.

EFFECT OF STEAM CONDENSATE ON PIPE—Carbon dioxide is the primary cause of return line corrosion. Like oxygen, carbon dioxide is present in all raw waters and may enter the boiler with the feed water. Most of the carbon dioxide found in the steam cycle results from decomposition of the bicarbonate or carbonate content of the boiler feed water. Build-up of insoluble products of corrosion—particularly in smaller lines—may plug the pipe and render it useless. Corrosion may cause grooving, channeling, pitting, completely penetrating the pipe wall.

A PIPING MATERIAL THAT COMBATS IT—New 4-D Wrought Iron is a two-component metal consisting of high purity iron and iron silicate fibers. There are over 250,000 non-rusting glasslike fibers to every cross-sectional square inch. The purity of the iron itself, plus the protection of the iron silicate fibers are a mighty formidable deterrent to steam condensate corrosion and its deleterious effects.

BYERS 4-D WROUGHT IRON

WASHINGTON OVERTONES

by LORING F. OVERMAN

● Excepting only the international concern over the illness of John Foster Dulles, a principal overtone in Washington echoes Capitol concern over the problem of "whither inflation."

Indicators point to the likelihood that the economy, like a youngster edging up an inclined teeter-board, senses the impending level-off period and must prepare for a quick counterbalance motion.

● Pressure for balancing action comes from three sources:

The President and his advisers hold that a balanced Federal budget is the only thing that will keep matters in hand.

Commerce Secretary Lewis L. Strauss has proposed a seven point program urging business men to unite in defending the economy against inflation.

Business associations — Chambers of Commerce and National Manufacturers Association — are joining in urging resistance to any new or out-size government expenditures.

● Others report a lull in the inflation tone. The price index seems to have leveled off, and productivity parallels wage increases. Inventories are building up, additional capacity is entering the market, and many inflationary factors are absent.

Government economists generally predict a moderate uptrend in business in coming months, with a possible leveling off during the second half of the year.

It is at this point that uncertainties appear.

The optimists contend that when the business recovery hits full stride, inflationary forces will again take over. They predict an auto boom, housing increase, and a tremendous upturn from the current "buy-anything-on-credit" movement.

Given such an upturn, they hold, the wage-price spiral would be in motion again.

Direct controls over wages and prices would provide the only brake in such an event, they contend.

Meanwhile, more than 600 of 1500 college economists queried on the subject of how to control inflation, replied that credit controls would provide the answer.

● Heating, ventilating and air-conditioning people have an interesting stake—although possibly many years hence—in weather modification plans being discussed in Washington by the House Science and Astronautics Committee and the National Science Foundation.

Meeting in Washington in mid-February, the conferees seriously discussed "doing something about the weather." A second meeting was scheduled for late February, and another in April. At the third gathering, arranged by American Geophysical Union, there will be discussions of theoretical and experimental research on the scientific basis for weather modification.

Under consideration is a sort of interplanetary air-conditioning system based on cloud physics. Lest someone predict that it can't be done, witness the recent orbiting of a cloud-watching satellite which can report where the clouds are and which way they are going.

● Whatever the outcome of inflationary controls and weather-making, Congress was all set late in February to act quickly on new housing legislation.

The Senate was the first to act, passing a measure authorizing $2.1-billion for urban renewal projects, new insurance authority for the Federal Housing Administration, provision for 35,000 new public housing starts, an increase in FHA mortgage ceilings, and an increase in interest rates on GI loans and some FHA programs.

Within 24 hours of the Senate action, the Housing Subcommittee of the Banking Committee had recommended its version. Principal difference between the Senate

(Continued on page 8)

AEROJET AMERICAN MACHINE & FOUNDRY ATLANTIC & PACIFIC TEA COMPANY ATOMIC ENERGY COMMISSION BANK OF AMERICA BURROUGHS ADD MACHINE CADILLAC MOTORS CENTRAL CASUALTY INSURANCE COMPANY CHICAGO BRIDGE & IRON CITY OF HOPE HOSPITAL CONTINENTAL BAKING COMPANY CONVAIR EDISON COMPANY FAIRCHILD CAMERA CORPORATION FEDERAL TELEPHONE & RADIO FOOD FAIR STORES FRANKLIN STORES FEDERAL HOUSING ADMINISTRATION F. W. WOOLWORTH COMPANY GENERAL ELECTRIC HUMBLE OIL COMPANY J. C. PENNEY CO ER ENGINEERING KAISER PERMANENTE HOSPITAL A MINING & MANUF YORK TELEPH STORES PHILLIP MERICA REPUBL EBUCK SYLVANIA ELEC U. S. NAVY U. S. ARMY U. S. AIRFORCE W COMPANY W. T. GRANT STORES U. S. NAVY LOCKHEED AIRCRAFT LUCKY LAGER BREWING MINNESOTA MINING & MANUFACTURING NATIONAL CASH REGISTER NATIONAL FOOD STORES NEW YORK TELEPHONE COMPANY OLIN MATHEISON PACIFIC GAS & ELECTRIC PENN FRUIT STORES PHILLIPS PETROLEUM RAND McNALLY & COMPANY RADIO CORPORATION OF AMERICA REPUBLIC AVIATION ROBERT HALL CLOTHIERS SAFEWAY STORES SEARS & ROEBUCK SYLVANIA ELECTRIC UNIVERSITY OF SOUTHERN CALIFORNIA WESTERN ELECTRIC COMPANY

GOVERNAIR

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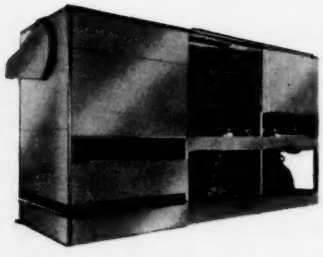

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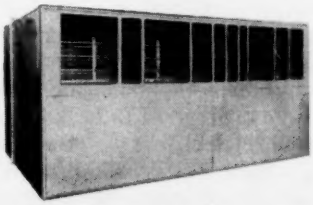
Self-contained Multi-Zone air conditioner — one of 18 basic Self Contained equipment models, available from 3 to 120 tons.

Model GMZ

Governair also "Satisfabricates" a complete line of Vertical, Horizontal and Multi-Zone Air Handling Units.



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. . . that's the copyrighted term that describes Governair air conditioning . . . equipment which is so basically flexible in design, that it can be manufactured to fit almost *any* space and load requirement.

This beneficial feature, pioneered and developed by Governair, is coupled with imaginative, tested engineering and quality workmanship. The end result is an installation that's a much *wiser* dollar investment.

Write for detailed information, or consult your yellow page directory for the name of our local representative.

THE GOVERNAIR CORPORATION
4840 N. SEWELL • OKLAHOMA CITY

WASHINGTON OVERTONES *(Continued from page 6)*

and House versions was the long-range public housing program called for in the House bill. It covered 200,000 starts at the rate of 35,000 a year.

● Spur to Congressional action was the fact that private home building dipped slightly more than seasonally in January to an adjusted rate of 1,350,000 units, according to Department of Labor reports.

Total housing starts during January declined 5% to 86,000 units. This, however, was 27% above the January, 1958, figure and close to the 1955 record for the month. The drop was in private starts, which totalled 83,300. This was 20,400 units above January of 1958.

Public housing starts totaled 2,700 last month, compared with 1,500 in December and 5,000 in January of 1958.

Outlook for home building during 1959 is considered dependent upon housing legislation and the supply of mortgage money. Current indications are that Congress will pass, with Presidential approval, a bill which would permit private starts somewhat in excess of 1.2-million a year.

● Competition between oil and coal producers for the industrial market continued in February to involve discussions at Washington levels.

In a statement filed with the Office of Civilian and Defense Mobilization, the National Coal Association said it considered unlimited imports of residual oil from European markets a threat to national security. Such imports, NCA contends, would prove dangerous to East Coast industries, concentrated users of residual oil, in the event of attack. Coal capacity, if shut down because of lack of steady demand for its products, would be unable to fill the gap in the case of sudden cutting off of imports.

● Rural Electrification Administration officials, meeting in Washington recently, expressed keen interest in increased domestic heating as a between-season builder of electrical load in rural areas. Use of electricity in those areas was reported to be highest in summer, when power is in demand for farm work. It was also pointed out that electric heat is more economical in the country than in town, due to the high cost of delivering other fuels.

● Government personnel at all levels interested in unitary air conditioning equipment are being given a look at the Air-Conditioning and Refrigeration Institute's new booklet, "A New Assurance—for the specifier, seller, installer and buyer of unitary air-conditioners."

The booklet, approved by 33 manufacturing companies participating in the ARI Unitary Air-Conditioner Certification Program, explains the program in detail. It also tells of the various tests made to assure that "certified" units are rated according to applicable ARI standards, and lists the names of participating companies, which represent more than 80% of the total U.S. output of unitary air-conditioners.

● The Refrigeration and Air Conditioning Contractors Association (RACCA) has opened a new headquarters office in Washington. New address is 1632 K St. N.W., where Leo Howard Kerns is the managing director.

In announcing an eight-point program to be known as "Operation Teamwork," President C. L. Walling said, "I feel that we now have a national organization of great force and efficiency which will benefit business and the public across the nation and, at the same time, be of invaluable assistance to every member."

● Air-Conditioning and Refrigeration Institute reports the sale of more than half of the space set aside for its 11th annual exposition in Atlantic City next November. This sales record, months ahead of the exposition, is taken by Show Director George E. Mills to mean that a sellout is virtually assured.

And in Cleveland — A FUTURE OF FAULTLESS SERVICE

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Cleveland, Ohio

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architects

HOWARD BENNETT & ASSOCIATES
mechanical engineers

ROEDIGER CONSTRUCTION, INC.
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plumbing contractor

AMSTAN SUPPLY DIVISION
wholesale distributor

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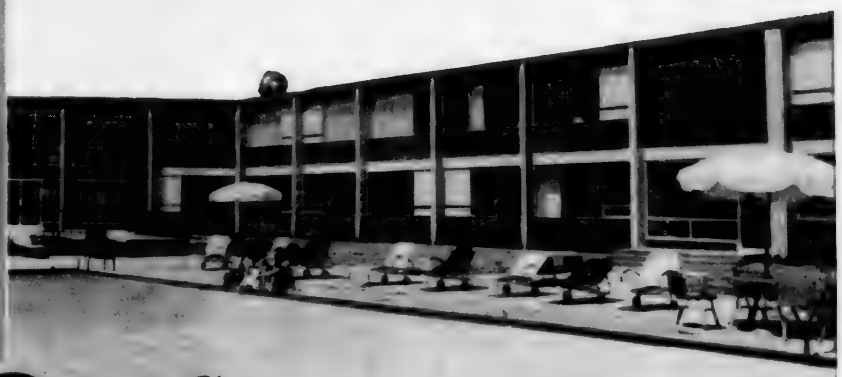
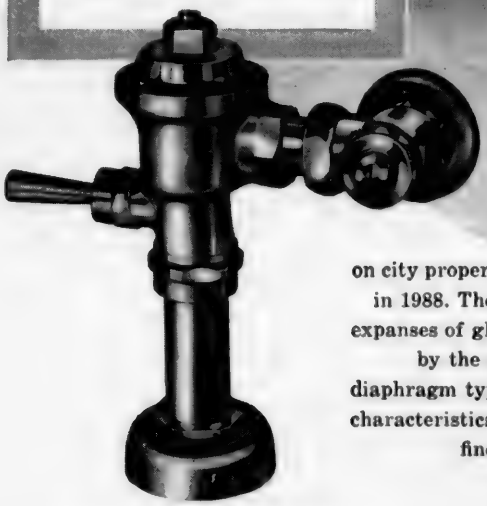
plumbing fixture manufacturer





Greater Cleveland can be proud of the beautiful, new Hopkins Hotel, a noteworthy COYNE & DELANY installation immediately adjacent to Hopkins Airport, and one of the finest of its kind anywhere in appearance, comfort and service.

The local citizenry can also take satisfaction in that the Hotel stands on city property and, under a unique arrangement, ownership will pass to the city in 1988. The two wings of the structure, featuring colorful glazed brick and large expanses of glass, harmonize with the nearby Airport Terminal Building designed by the same architectural firm. In all 145 guest units of the Hotel, DELANY diaphragm type flush valves were selected for the extraordinary performance characteristics that have made them famous. In Cleveland, and everywhere, you will find DELANY—"the fastest growing name in flush valves!"

DELANY "TURN-TO-SILENCE" EQUIPMENT CUSHIONS WATER NOISE TO A WHISPER

For luxurious hotel-motel installations, specify whisper-quiet Delany Flush Valves with "Turn-To-Silence" Equipment. Objectionable turbulence noises are softened at their two main sources . . . the shut-off valve and main valve seat. An exclusive Delany Design feature catches swirling water at these two points . . . cushions and absorbs its turbulence without diminishing pressure and with a minimum of flow obstruction. Depend on Delany . . . for the Leaders Design in Flush Valves!

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IN CANADA: THE JAMES ROBERTSON CO. LTD.

DELANY *Flush* VALVES Since 1879

BRIEFLY STATED

WITH THE ENGINEERS

For the next year, announces Willis R. Woolrich, consulting dean of the University of Texas College of Engineering, most of his time will be devoted to organizing the permanent engineering and science educational and research program, as consulting president of Middle East Technical University, Ankara, Turkey. The project is jointly sponsored by the Turkish and United States Governments. . .

Roderick Kirkwood and Henry Birner are among five new partners announced by JOHN GRAHAM COMPANY, ARCHITECTS AND ENGINEERS, 1426 Fifth Avenue, Seattle 1, Wash., and 444 Fifth Avenue New York 18, N. Y. Both are professional engineers. Among the eighteen associates announced simultaneously are the following directors—in New York: James D. McWalters, structural, and Milton H. Edelman, electrical; in Seattle: Anthony P. Burzenski, civil; Howard Leuschen, structural; and Gerald R. Cysewski, traffic and highway engineering. The firm is broadening the base of management for the first time in its 58-year history because its projects are spread out over the globe and because of the complexity of coordination between air conditioning and the structure, requiring engineering know-how from the beginning of the project. Three other new partners, all members of American Institute of Architects, are Manson O. Bennett, Jack L. Follett, and Nathan Wilkinson. . .

SNYDER, PALMER, TOUSSAINT AND ASSOCIATES, INC., is the new name of the Minneapolis consulting engineering firm formed by the association of Eugene P. Palmer and Francis J. Toussaint with J. Robert Snyder, consulting engineer. The firm offers mechanical and electrical engineering services and occupies offices at 1645 Hennepin Avenue, Minneapolis, Minn. Mr. Snyder has conducted a consulting engineering practice at the above address for the past several years. His work has included heating, ventilating and plumbing design for Anoka County Centennial Junior High School, Thermo King Office Building, and additions to Moose Lake State Hospital. Mr. Palmer has been previously employed by Lang and Raugland, Inc., where his work has included air conditioning, heating and plumbing design for the new Minneapolis Public Library, Floyd B. Olson Memorial Homes federal housing project, Elizabeth Kenny Institute, Peace Lutheran Church, and Lake City Schools. Mr. Toussaint has been previously employed by Lang and Raugland, Inc., and Ellerbe and Company, where his work has included electrical design for the Floyd B. Olson Memorial Homes federal housing project, Macalester College dormitories, Peace Lutheran Church, and Lake City Schools. All three are graduates of the University of Minnesota. Mr. Snyder and Mr. Palmer are registered mechanical engineers and Mr. Toussaint is a registered electrical engineer. . .

Due to the retirement from active practice of Joseph W. Leinweber, the firm of Yamasaki, Leinweber and Associates is changing its name to MINORU YAMASAKI AND ASSOCIATES. Mr. Leinweber will continue his association with the firm as a consultant. . .

JOHN D. WATSON and JAMES E. HART announce the dissolution of their partnership. Mr. Watson will continue the practice of structural, mechanical, and electrical engineering at 914 Summit Ave., Greensboro, N. C., and Mr. Hart will practice mechanical and electrical engineering at 4500 Colley Ave., Norfolk, Va. . .

DANIEL M. ROOP announces that he is now actively engaged as a professional engineer offering consulting services in hospital design and engineering management at 1445 East Crestwood Dr., Memphis 17, Tenn. He has been a president and general manager, Greater Boston Homes, Inc.; project engineer, Metcalf & Eddy, Boston; plant engineer, New England Medical Center, Boston; chief engineer, George F. Geisinger Memorial Hospital, Foss Clinic; and administrative engineer, Baptist Memorial Hospital, Memphis. . .

Walter L. Threadgill has been appointed plant engineer of the Engineering Works Division of DRAVO CORPORATION, Pittsburgh, Pa. This new responsibility will be in addition to his present assignment as methods engineer for the division. A native of Texas, Mr. Threadgill received a degree in mechanical engineering from Massachusetts Institute of Technology in 1941. He first joined Dravo in 1941 as an engineer in the Keystone Division. In 1946, Mr. Threadgill took a position as plantation engineer for the Hawaiian Pineapple Company and in 1954 rejoined Dravo. . .

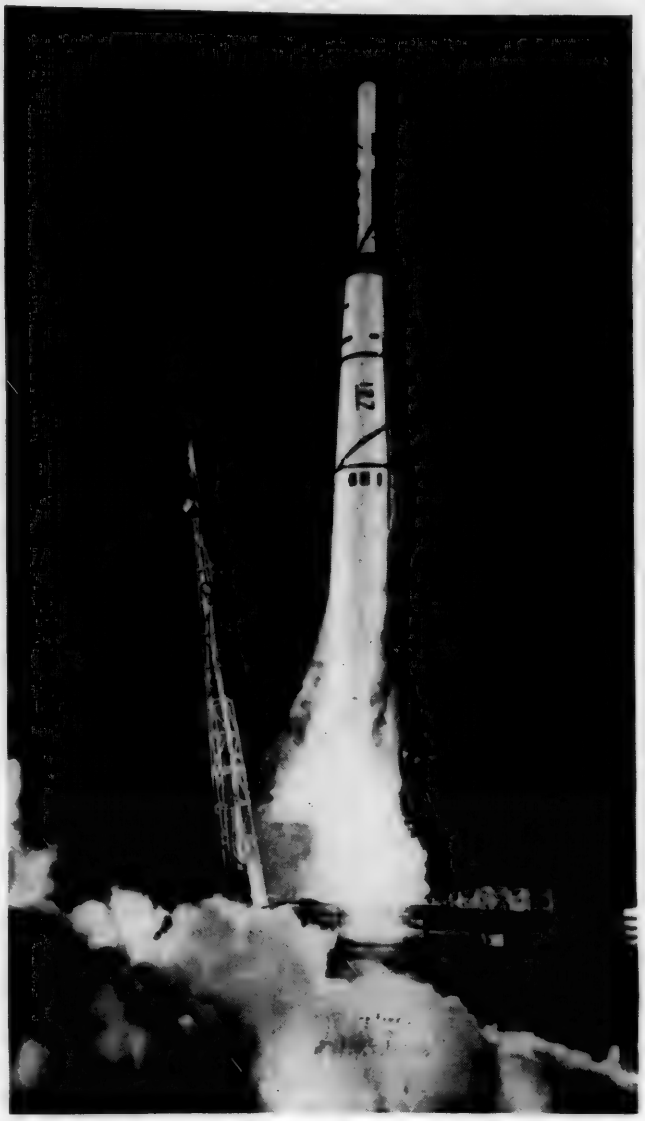
Engineering consultants Allen Johnson, P.E., and Paul Mulcey, P.E., have joined FUEL ENGINEERING CO., INC., New York, N. Y., as associates, Gregory Gould, president, announced. Mr. Johnson is a consulting mechanical engineer, specializing in the field of fuels and combustion and is co-author of *Fuels and Combustion Handbook*. Mr. Mulcey has acted as consultant in the field of research and fuel utilization for the governments of Peru and Turkey and has recently returned from Geneva, Switzerland, where he was a member of the U. S. delegation on organization of European Economic Cooperation and U. S. Economic Commission for Europe. . .

I. J. Karassik has been appointed Consulting Engineer and Manager of Planning for the WORTHINGTON CORPORATION HARRISON (N.J.) DIVISION. Formerly Consulting Engineer and Assistant to Vice-President, Mr. Karassik will act as Consulting Engineer to all departments in the Division. A top-flight specialist on centrifugal pumps, Mr. Karassik has written about six hundred articles on the subject which have appeared in technical publications in the English, Russian, Spanish, French, Italian, and Swedith languages. . .

Appointment of Alfred H. Gerber as chief estimator of THE H. K. FERGUSON CO., engineers and builders, Cleveland 14, Ohio, was announced by Ralph W. Olmstead, president. In his new position, Mr. Gerber will supervise the preparation of all of the firm's engineering design and construction estimates. A registered engineer in Ohio and New York, his most recent assignment was that of chief structural engineer in the company's main office, in which position he was responsible for the structural engineering performed on the firm's far-flung projects.

(Concluded on page 12)

In missiles and millinery shops, movies and map centers . . .



Rising slowly on a column of flame, a giant guided missile lifts from its launching pad. Air-conditioning plays an important part in the manufacture and assembly of missiles by protecting intricate parts against temperature and humidity variations.

You'll find

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SUPER-DRY REFRIGERANTS

Filling the Air-Conditioning and Refrigeration Needs of Modern America

In thousands of different air-conditioning and refrigeration applications, you can count on "Genetrons" for top performance. These refrigerants are universally accepted for use as original or replacement charge. Leading manufacturers, refrigeration engineers and air-conditioning and refrigeration wholesalers approve, specify and recommend them. They offer unexcelled quality and dryness . . . and their strict specifications are consistently *bettered* in production.

"Genetron" Super-Dry Refrigerants are available from wholesalers everywhere, coast to coast. See your wholesaler. Ask for "Genetron"!

genetron 11 ORANGE LABEL CCl_3F TRICHLOROMONOFLUOROMETHANE

genetron 12 WHITE LABEL CCl_2F_2 DICHLORODIFLUOROMETHANE

genetron 22 GREEN LABEL $CHClF_2$ MONOCHLORODIFLUOROMETHANE

genetron 113 PURPLE LABEL $C_2Cl_3F_3$ TRICHLOROTRIFLUOROETHANE

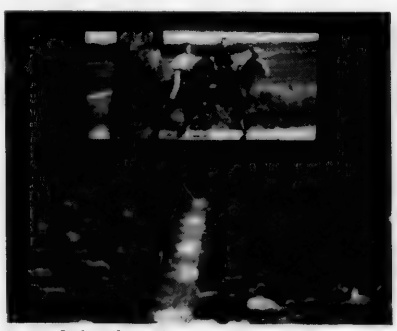
genetron 114a BLUE LABEL $C_2Cl_2F_4$ DICHLOROTETRAFLUOROETHANE

Allied Chemical

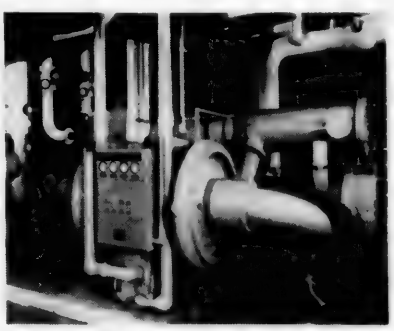
GENERAL CHEMICAL DIVISION

40 Rector Street, New York 6, N. Y.

No fuss—but plenty of feathers as milady tries on one hat after another in her air-conditioned millinery shop.



Part of the show in our modern American movie theatres is comfortable air-conditioning. Movie managers have learned that the "air-conditioned" sign on a theatre marquee is good for business.



At the Army's map service center, Kansas City, Missouri, this 100-ton refrigeration unit helps control temperature and humidity. The paper, plastic and film used in map-making require precise temperature and humidity control. *The Trane Company Photo*

BRIEFLY STATED

(Concluded from page 10)

SOCIETY AND ASSOCIATION NEWS

On January 29, 1959 the legal requirements were completed and the merger of ASRE and ASHAE into the AMERICAN SOCIETY OF HEATING REFRIGERATING AND AIR-CONDITIONING ENGINEERS became official. The new officers of ASHRAE for the period ending June 24, 1959 are: Cecil Boling, president; A. J. Hess, first vice-president; D. D. Wile, second vice-president; W. A. Grant, third vice-president; R. H. Tull, fourth vice-president; J. H. Fox, treasurer; and A. V. Hutchinson, executive secretary. No single office address has been issued to date, so that the ASHAE section is still at 62 Worth Street, and the ASRE Section at 234 Fifth Avenue, New York City. . .

The dates of the next Annual Meeting of the AMERICAN SOCIETY OF SANITARY ENGINEERING to be held in Washington, D. C., at the Mayflower Hotel, have been changed to July 19-24, 1959. The change was made because of a conflict with the schedule of The National Apprenticeship Program, sponsored by the United Association, and the NAPC Apprenticeship Contest Events, at which many ASSE members are scheduled to appear. . .

Consideration of more effective use of engineers by companies which employ them will highlight the topics to be discussed at the fourth Design Engineering Conference, sponsored by the machine design division of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS, in Philadelphia, next May. The conference is held concurrently with the Design Engineering Show which is produced by Clapp & Poliak, Inc., New York exposition management firm. Both events are scheduled for Convention Hall, Philadelphia, May 25 to 28, inclusive. Conference sessions will take place in the mornings and the show during afternoons. . .

NATIONAL INSULATION MANUFACTURERS ASSOCIATION has been formed by members of the industrial insulation industry of the United States at a recent meeting held at 441 Lexington Ave., New York 17, N. Y. Announcement was made by the president of the organization, E. H. Luchs of Mundet Cork Corporation. The Association has been formed as a voluntary and unincorporated organization designed to render service to manufacturers of insulation for industrial and commercial use and to promote the welfare and development of the industrial insulation industry. Officers of the Association include Mr. Luchs, president; R. A. McLaughlin, Pittsburgh Plate Glass Co., vice-president; F. T. Christenson, Refractory and Insulation Corp., treasurer; J. M. Barnhart, exec. secretary.

* * *

After nearly forty-eight years of continuous service with the present company and its predecessors, Stewart E. Lauer has announced his retirement as chairman of the board of York Corporation, a subsidiary of Borg-Warner Corporation, and also as chairman of the supervisory board of the York Division of Borg-Warner Corporation. Although his retirement was effective January 1, his services are available on a consulting basis. . .

BURGEONING BUSINESS

Robert Krasnow announced that he had become the sole owner and president of COBRA PIPE SUPPLY AND COIL CO., INC., Elmwood, Conn., by stock transfer from Cobra Pipe and Coil Company. Reason for addition of *Supply* to the old name of the radiant heating and snow removal coil fabricator is that plans are underway to greatly enlarge the company's Supply Division, which carries pipe and welding fittings. . .

LOOKOUT BOILER & MFG. CO., Chattanooga, Tenn., announces the combination at Chattanooga of its operations with that of ECLIPSE FUEL ENGINEERING Co., Rockford, Ill. Purchasing of Lookout's requirements will be done from Chattanooga by L. E. Rawlston. Entire combined operations will eventually move to Chattanooga. E. E. Magnuson, Lookout president, will carry on the work of former president James Haley, who will remain for a while to assist in the transition.

FRICK COMPANY, Waynesboro, Pa., has rejected the offers made recently to sell or merge the company with another firm. The Board of Directors, in session January 12, resolved that "whereas it has been found that the proposal . . . cannot be carried out due to unavoidable tax and other incidental problems . . . no deal is possible and that negotiations should be discontinued." Frick will continue under its former ownership and control, and will retain the name under which it has been doing business for 106 years. . .

BAYLEY BLOWER CO., Milwaukee, Wis., designer and manufacturer of industrial and ventilating fans, humidifiers, and heating coils since 1856, has been acquired by GREEN FUEL ECONOMIZER CO., INC., Beacon, N. Y. Green, founded in 1875, designs and manufactures cast iron fuel economizers, heavy-duty fans, air filters, and industrial heat collecting systems. The two companies will complement each other to produce a complete range of air-moving equipment. Frank J. Hamilton, formerly general manager, is elected president of Bayley, succeeding George E. Szekely, who has resigned. . .

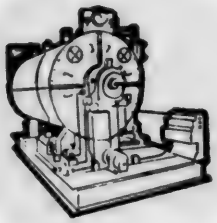
CARNES CORPORATION, Verona, Wis., announced acquisition of the assets of Senrac Industries, Madison. Senrac manufactures louvers and dampers for commercial, industrial, public and institutional buildings. Carnes is a wholly owned subsidiary of Wehr Steel Co., Milwaukee, manufacturer of diffusers, registers, grilles, and roof ventilators and sells to the same market as Senrac. The Senrac operation will be moved immediately into the newly expanded Carnes plant facilities at Verona. . .

TETER, INC., Chicago, Ill., manufacturers of Imperial water heaters, has purchased all the equipment for production of water heaters from A. J. Linderman and Hoverson Co., manufacturers of the L & H (Lectro-Host) water heaters, subsidiary of Norris-Thermador Corporation. This equipment will be used in conjunction with Teter's recent $150,000 building expansion to meet increased production demands for their automatic water heaters.

Woods & Woods, 101 Park Ave., New York, N. Y., is appointed sales representative for CORDLEY & HAYES, manufacturers of electric water coolers. They represent other plumbing lines, too.

HOT INSIDE STORY

...ON THE NEW HOT WATER Powermaster®



The brand new *Powermaster* packaged automatic hot water boiler has a unique inside story. More than two years of research went into the development of an internal circulation system that keeps temperature gradients lower than in any other boiler. The result is rapid water heating with minimum thermal shock.

Add to this the outstanding performance of *Powermaster's* integrated burner-boiler design at all loads and you have an unbeatable package to supply the most advanced forced circulation heating applications in the 20 to 600 hp range. Your local O&S representative can give you the hot story on this new *Powermaster*. Or, if you prefer, write for Bulletin 1251.

Powermaster®

PACKAGED AUTOMATIC BOILERS

ORR & SEMBOWER, INC.

980 Morgantown Road

READING, PA. • Since 1885

Scientific Frontiers

Silent World of Cryogenics

Fifty years ago researchers first entered the silent world a few degrees above absolute zero: minus 459.6 deg F. They discovered that ordinary matter displayed "superbehavior" in that extreme cold. And, according to Dr. Milan D. Fiske and Dr. Roland W. Schmitt, both of General Electric's Research Laboratory, in the November, 1958, issue of *General Electric Review*, subsequent investigation uncovered "superconductors" that carry electricity without resistance to current flow, and a "superfluid" that flows uphill and conducts heat three-hundred times better than copper at room temperature. The term "cryogenics" (from the Greek *kryos*, meaning icy cold) describes the science of low-temperature phenomena.

To reach these very low temperatures, liquid hydrogen or liquid helium is used as a refrigerant. Because helium requires such a low temperature (minus 452 deg), it was the last of all gases to be liquefied. Originally discovered on the sun, helium was first liquefied in 1908, thirteen years after its discovery on earth. New techniques and machines developed over the years hold promise that within a few years liquid helium and hydrogen will be as universally available and important to industry as liquid air, oxygen, and nitrogen are today.

Beside having a definite value through direct use in their liquid state (such as liquid hydrogen and oxygen as rocket fuels) and through permitting improved, more economical methods of storage and transportation for industries whose ultimate use is their gaseous form, these liquefied gases create a low-temperature environment that has uncovered many new technological opportunities and discoveries:

Thermal behavior. The higher the starting temperature, the more heat is required to raise the temperature of a body another degree. About 6000 times as much heat must be applied to raise a piece of copper from 300 to 301 deg K as is needed to bring its temperature from 2 to 3 deg K. Thermal expansion coefficients of solids follow the same pattern, approaching zero as temperature approaches absolute zero. This fact greatly simplifies testing of equipment designed for low-temperature work. At room temperatures, equipment is built that the chilly world of low-temperature research will shrink. Differential stresses from parts made of different materials could really "freeze" their operation. Usually, equipment can be tested adequately by cooling only to liquid nitrogen temperature, 78 deg K.

Thermal Conductivity. The heat conductivity of pure metals and some crystals increases below room temperature. As temperature continues to fall, thermal conductivity stops rising and then begins to fall. This is true for non-electrical conductors as well as for metals. Thus in certain temperature ranges you can find materials that are electric insulators and also excellent thermal conductors.

Superconductivity. Superconductivity occurs in many metals, alloys, and compounds. Electrical resistance drops with temperature in a way normal for metallic conductors, until suddenly — at some very low temperature — resistance disappears altogether, and the material becomes a perfect conductor. Immediately envisioned are lossless transmission lines and transformers, but a strict limitation is imposed by another property of the superconductors: they expel magnetic fields below a certain size but will not remain superconducting if the magnetic field exceeds this size. This would occur due to the current flowing in a transmission line.

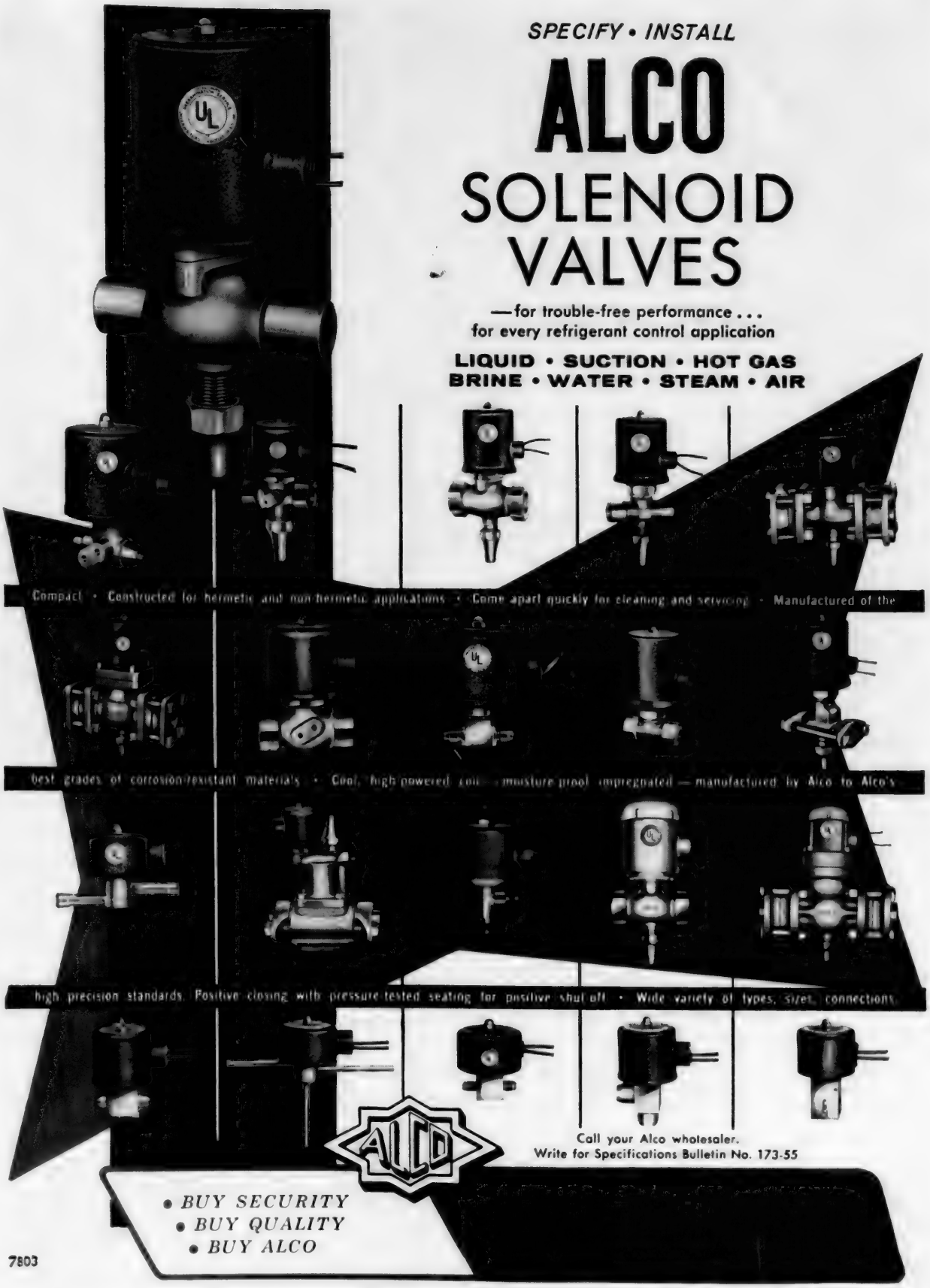
During World War II, the first application of superconductivity led to a bolometer for infrared detection. Impinging radiation brought a temperature increase to a strip of niobium nitride, superconducting at about 15 deg K, and the corresponding increase in resistance was followed electronically. The strip's small heat capacity made the detector both sensitive and fast in the heat detection of enemy targets.

SPECIFY • INSTALL

ALCO SOLENOID VALVES

—for trouble-free performance . . .
for every refrigerant control application

LIQUID • SUCTION • HOT GAS
BRINE • WATER • STEAM • AIR



Compact • Constructed for hermetic and non-hermetic applications • Come apart quickly for cleaning and servicing • Manufactured of the best grades of corrosion-resistant materials • Coil, high powered coil — moisture proof impregnated — manufactured by Alco to Alco's high precision standards. Positive closing with pressure-tested seating for positive shut-off • Wide variety of types, sizes, connections

Call your Alco wholesaler.
Write for Specifications Bulletin No. 173-55

• *BUY SECURITY*
• *BUY QUALITY*
• *BUY ALCO*

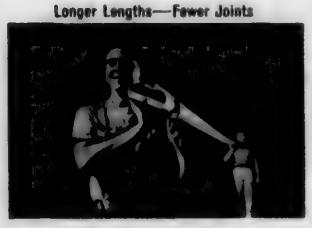
7803

The one complete line of refrigerant controls: Thermostatic Expansion Valves • Refrigerant Distributors Solenoid Valves • Suction Line Regulators • Flooded Evaporator Controls and Reversing Valves

LIGHTWEIGHT COPPER TUBE IS EASY TO INSTALL. Only *one fourth* the weight of ferrous materials—one man lifted and connected this long length of 6-inch copper drainage tube. Overhead work is easier with Anaconda copper tube—no heavy equipment for threading or caulking. In close quarters, copper tube and solder-joint fittings make light work out of tight work. Use this lightweight modern drainage tube—Anaconda copper tube—for your next drainage installation. For more information on copper tube, write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

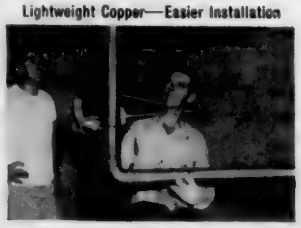
ANACONDA® **COPPER TUBE AND FITTINGS for soil, waste and vent lines**
Available through plumbing wholesalers. Products of The American Brass Company

Longer Lengths—Fewer Joints



Preassembly—Saves Time

Lightweight Copper—Easier Installation



Compact Connections—Save Space

NEW!

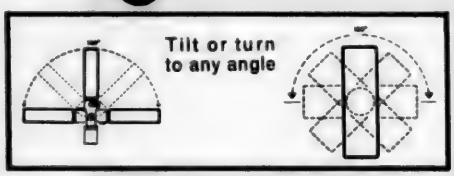
Dial Thermometers

Designed expressly for piping and duct work

One careful look at this new line of Marsh instruments will convince you that we have put into them *everything* that has been so long and widely needed in dial thermometers for piping and duct work . . . thermometers for use on heating and cooling equipment—for piping, air ducts, vessels and kilns, ovens and similar installations.

THE LINE IS COMPLETE. Four types, 7 ranges . . . 72 combinations to meet almost every conceivable condition as listed on the reverse side of this page. All have basic features that are found only in the Marsh line:

FAR MORE READABLE. Big, legible 3½″ and 4½″ dials . . . easy to see in places where piping and duct thermometers must be located. An even greater contribution to ease of reading is the provision for tilting and turning dials to any required angle of vision as diagrammed here and on the following page. No more climbing ladders or using flashlights to read obscure glass tube thermometers. And note that the line includes distant reading types that bring the dial into view even if the point of measurement is completely out of range.



UNBREAKABLE. Instead of the fragile glass tube thermometers customarily used for piping and duct work you now have the sturdy, unbreakable Marsh Dial Thermometer . . . long recognized as the best; now still more highly perfected.

MORE ACCURATE. Guaranteed accurate to plus or minus one division of the big open scale, these instruments have far greater *readable* accuracy than any glass tube thermometer. They also have the famous Marsh "Recalibrator"—to *keep* them accurate.

MORE ADAPTABLE. Your needs "designed" these instruments! Notice in the specifications on the following page how their design provides for every field condition. Separable sockets ("wells"), along with swivel nut for attachment of thermometer to socket, makes them easy to install—or to disconnect for servicing. Extension necks take care of insulated piping or ducts. Long stems in duct types place temperature-sensitive section where it should be for accurate indication.

To know the full scope of this new Marsh line read the specifications on the reverse side of this page. Every instrument in the line is—

Available from stock

Write for Bulletin PD

For piping

Dial Sizes: 3½″ and 4½″.

Ranges: 0° to 100° F for chilled water.
20° to 120° F for condenser water.
40° to 240° F and 100° to 300° F for hot water and domestic water.

¼″ NPT male connection.

For ducts

Dial Sizes: 3½″ and 4½″.

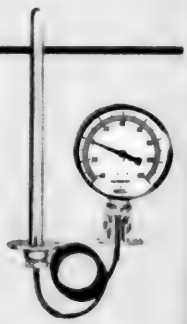
Ranges: minus 40° to plus 120° F; 0° to 160° F; 0°—220° F for ducts, kilns, ovens and similar jobs.

See reverse side for listing of sockets, flanges and stems.

Also remote reading

Piping and duct thermometers of same basic design are available with six feet of capillary tubing as shown.

See reverse side for listing of sockets, stems, ranges, etc.



. . . . Specifications on reverse side

specifications OF MARSH PIPING AND DUCT THERMOMETERS

(read complete description on preceding page)

PIPING THERMOMETERS

Piping thermometers are the Vapor Tension type which permits wide divisions in the important reading area (see cuts). They are standard with Marsh "Recalibrator." Both direct mounting and remote reading types, as illustrated here, are standard as follows:

Two sizes:

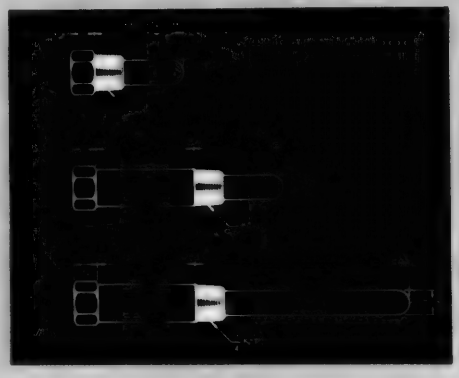
3½" and 4½" dial size.

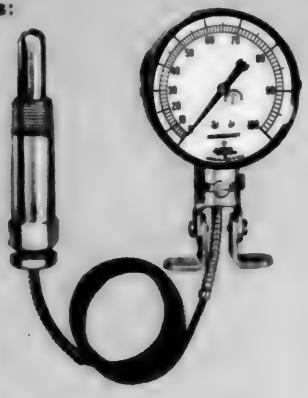
Four ranges:

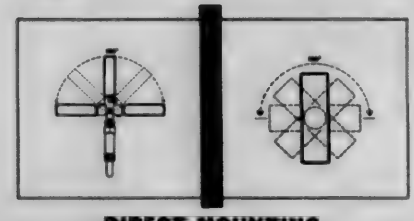
0° to 100° F for chilled water.
20° to 120° F for condenser water.
40° to 240° F for hot water heating and domestic hot water.
100° to 300° F for hot water heating and domestic hot water.

Connection

¾" NPT male.

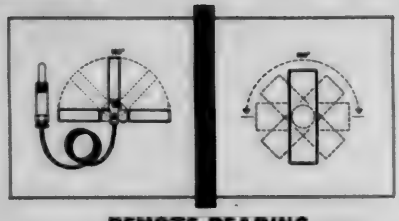






DIRECT MOUNTING

Three standard separable sockets for any thermometer in any range (see dimensions in drawing). Additional sockets may be purchased. Diagrams show how thermometers may be tilted and rotated.



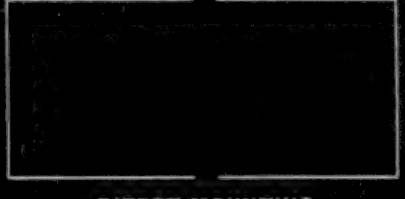
REMOTE READING

DUCT THERMOMETERS

Two sizes:

Three ranges:

Two extension necks and stem lengths



DIRECT MOUNTING

REMOTE READING

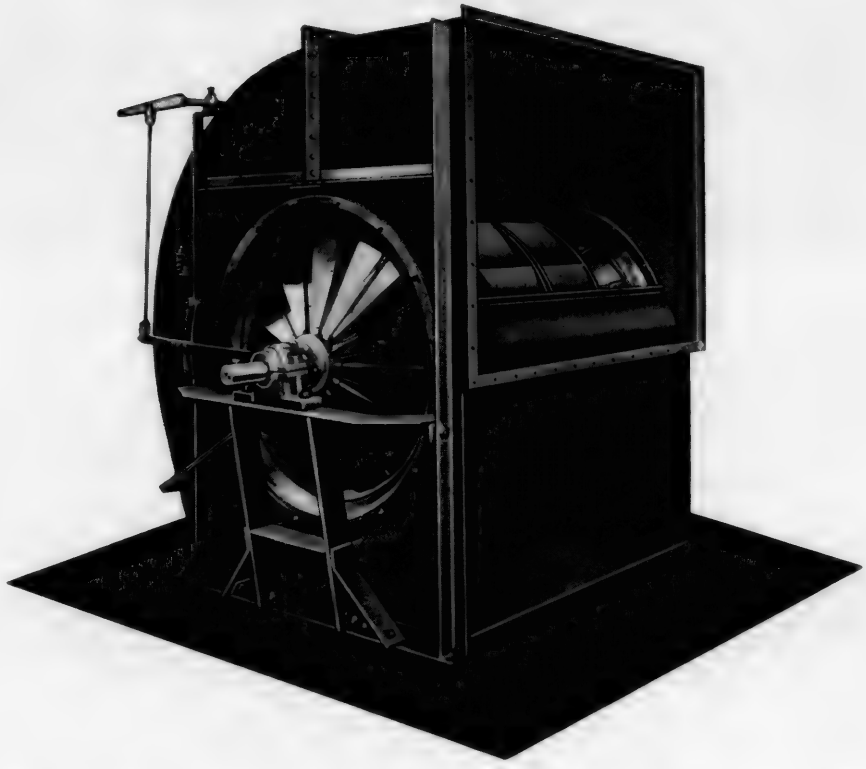
MARSH

Marsh products include: Pressure Gauges • Dial Thermometers • Steam Traps, Radiator Valves and Traps, Vents and other heating specialties • Refrigeration Testing Instruments • Water Regulators • Solenoid Valves • Needle Throttling Valves

Write for bulletins **Jas. P. Marsh Corporation, Skokie, Ill.**

CLARAGE

Presenting new highs in quietness and dependable broad efficiency...



NEW DYNAFOIL heavy-duty FAN

featuring a perfected airfoil blade design

With this new Clarage Type AF Dynafoil Fan you get stable high efficiency where it counts—under actual operating conditions.

Ideally suited to mechanical draft and heavy-duty applications, such as industrial processes, conduit type air conditioning, and tunnel ventilation, this latest in the Clarage line of superior fan equipment is built in 13 sizes, Classes II, III, and IV construction.

WRITE FOR CATALOG 859 which provides outlined dimensions and description of new Clarage Type AF Dynafoil Fans. Or contact nearest office.

Dependable equipment for making air your servant

CLARAGE FAN COMPANY

Kalamazoo, Michigan

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal

National Wax Company, Skokie, Illinois, designed and built by Ragnar Benson, Inc., Chicago. O. A. Wendt Co., mechanical contractor, Chicago.

New Wax Plant Makes Varied Use of Pneumatic Control System

At the new National Wax Company plant in Skokie, Illinois, Johnson Pneumatic Controls provide flexible, precise regulation of process steam, hot water and air conditioning as well as of the comfort air conditioning, heating and ventilating systems. The photographs on the opposite page show examples of how this specially planned Johnson System solves the diversified control problems involved in producing petroleum waxes for the food and container industries.

Johnson has installed thousands of pneumatic control systems to meet the specialized requirements of industrial users. Johnson Pneumatic Controls are applied to all types and makes of air conditioning, heating, cooling and ventilating equipment and to a wide range of processes.

Besides providing reliable, high-accuracy control, a Johnson System offers important economic advantages. For example, pneumatic controls are simpler, have fewer components, are easier to understand and operate and require less supervision and maintenance than anything else you can use. Power consumption is but a fraction of that used by other types of controls. And, Johnson equipment does not require the type of periodic maintenance-replacement program that eventually replaces the system. *Your clients pay only once* for, given ordinary care, a Johnson System can be expected to last for the life of the building.

Next time you have a control problem, have a nearby Johnson engineer explain the advantages of performance and economy offered by a pneumatic control system. There is no obligation.

JOHNSON CONTROL

PNEUMATIC SYSTEMS

DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885

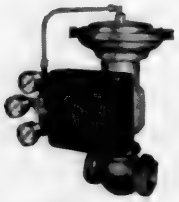
R-1051
Static Pressure
Indicator-Controller

T-800 Remote
Bulb Thermostat

V-210 Three-Way
By-Pass Valve

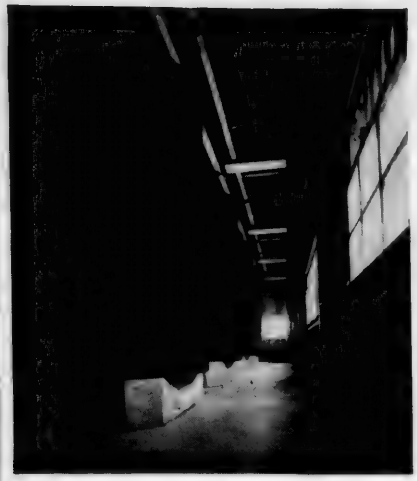
T-400
Room Thermostat

V-108
Three-Way
Mixing Valve

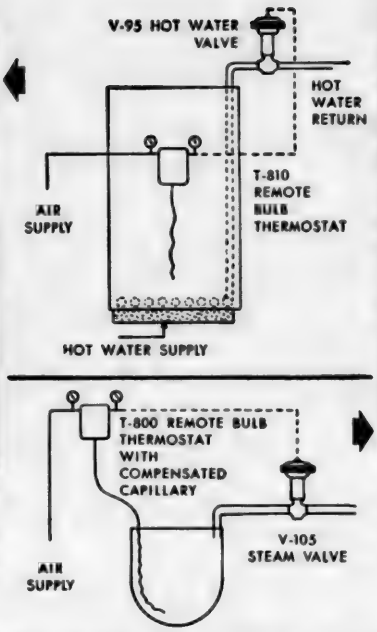


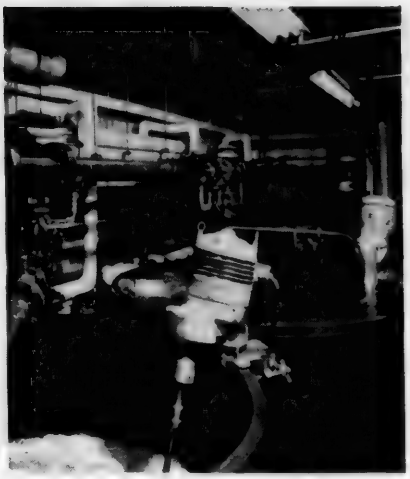
V-530 Precision
Pilot Positioner
applied to valve

D-225
Louver Damper



Tank Farm. Temperatures in twenty 12,000-gallon tanks for storing petroleum waxes are individually controlled by Johnson Thermostats and Valves. Wax is delivered in tank cars, heated to liquid form and piped in through heated lines.





Compounding. Ingredients are mixed in kettles containing up to 3,000 gallons. Kettle temperatures are controlled by Johnson Remote Bulb Thermostats which modulate Steam Valves to maintain a constant condensate return temperature.

Slabbing. Johnson Controls regulate the cooling system for the slabbing room where overnight 40 tons of hot wax are cooled to 40F for packaging in solid form. An economizer control arrangement cuts cooling costs by utilizing outdoor air instead of mechanically cooled air whenever possible.

Comfort Controls. The Johnson System assures an ideal working environment, includes individual room control of the office section air conditioning. Night setback feature keeps costs down. Shown at his desk is J. M. Packel, National Wax Company president, with W. J. Noll, traffic manager.

Johnson makes the most complete line of pneumatic control equipment for solving any problem of temperature, humidity and pressure control. Equipment includes thermostats, recorder-controllers, valves, dampers, damper operators, pressure regulators, humidostats, humidifiers, thermometers, switches, special controllers and related apparatus.

Complete engineering, sales and service facilities are available through 105 direct branch offices in the United States and Canada.

V-153 Sylphon Diaphragm Valve

D-251 Piston Damper Operator

T-1000 Recorder-Controller

JOHNSON SERVICE COMPANY
507-C East Michigan St., Milwaukee 1, Wisconsin

Please send me a condensed catalog of Johnson equipment.

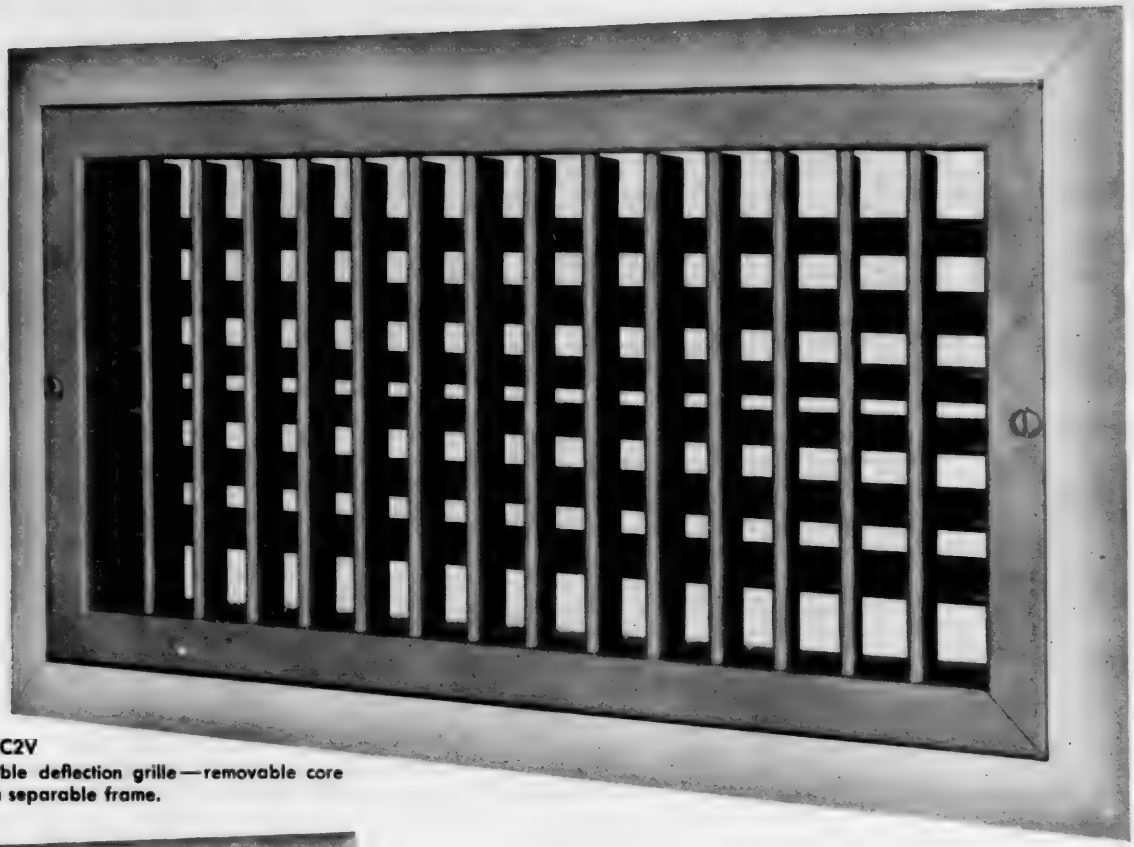
Name & Title_____

Firm_____

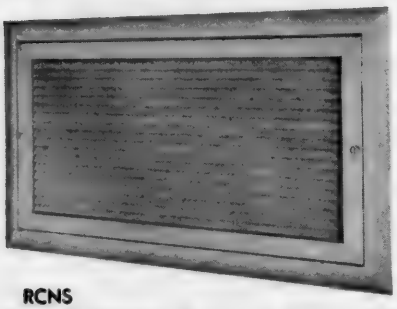
Address_____

City & State_____

Now... WATERLOO *presents*
removable core grilles



RC2V
Double deflection grille—removable core with separable frame.



RCNS
"No-Site" inverted V shaped blades with removable core and separable frame.

RC3HD
Return air grille with fins fixed at 45° with removable core and separable frame.

Completely removable cores—unique design separable frames

Designed to enhance all modern interiors, these new Waterloo removable core grilles offer many significant advantages:

1. Cores slip out easily—prevent damage to plaster or painted walls.

2. Unique design separable frames allow maximum free area. Trim radius edges of frames add streamline appearance to room decors.

3. Removable core grilles are either all aluminum construction or separable aluminum frames with conventional cores. Either type may be specified.

4. Waterloo removable cores are available with models shown or on any other Waterloo supply and return grilles or registers.

Reap these benefits by specifying Waterloo removable core grilles on your next job. *Write for new comprehensive Waterloo Catalog.*

WR-110

WATERLOO
Air Diffusion
EQUIPMENT

WATERLOO REGISTER COMPANY, INC.
WATERLOO, IOWA

They compared "K" factors and cost factors . . . and bought SNAP*ON®

Compare cold line applications, for example — for thermal efficiency, economy and ease of application, you, too, will find that there is nothing like Snap*On, the one-piece pipe insulation molded of fine glass fibers. It is available in a wide range of sizes from copper tubing to 36″, with factory-adhered vapor barrier jackets, ready to snap quickly on the pipe, easy to seal on bends and seams. Snap*On's thermal efficiency rates at the top of all general purpose pipe insulations — and it is *permanent*.

For many of the same reasons you will want to specify Snap*On for heated lines up to 350°. For a free analysis of your pipe insulation requirements — and a cost comparison with other insulations — just ask your G-B distributor for a TEVA (Thermo-Economic Value Analysis) survey the next time you insulate hot or chilled lines.

FOR FREE TEVA SURVEY CALL YOUR LOCAL G-B SNAP*ON DISTRIBUTOR
(LISTED IN YELLOW PAGES)

GUSTIN-BACON *Manufacturing Co* GUSTIN gb BACON

222 W. 10th ST., KANSAS CITY, MO.

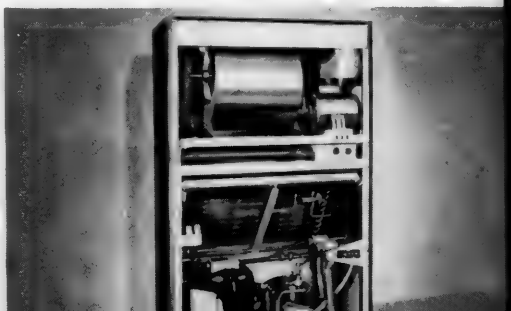
Thermal and acoustical glass fiber insulations • Couplings and fittings for plain and grooved end pipe • Molded glass fiber pipe insulation

New models, new sizes, Trane Self-Contained

Air-cooled condenser (available for all sizes) features new, smaller dimensions, simplified piping and wiring for easy installation. Water-cooled condensers (all sizes) and evaporative condensers (10 through 20-ton sizes) also available.

Simplified construction speeds installation and service! All components of these new Climate Changers are easily accessible from front. Refrigeration cycle is easily removable for inspection, service on the job —or for in-shop repair or exchange.

Improved "iso-sound" design assures quiet, vibration-free operation. Cabinet and compressor housing completely insulated. Deluxe units may be installed in the conditioned space without disturbing occupants or employees.



new styling for Climate Changer Units

3 to 30-ton packaged units — air or water-cooled — are easier to install, easier to service

Here's the new line-up of TRANE Self-Contained Climate Changers for 1959: new air or water-cooled units in a complete range of sizes from 3 to 30 tons. And they're beauties! New, modern styling, clean, classic lines, smaller dimensions make them blend with today's office and store design. And, of course, these new units are engineered to the same rigid specifications that have made TRANE a leader in big building air conditioning systems. They're easy to install, too, with just a few simple piping and wiring connections. Extra rugged construction makes them easy to ship and to handle on the job. So for your next "packaged" cooling job, make it a TRANE Self-Contained Climate Changer! Call your nearby TRANE Sales Office for complete facts on these new Climate Changer units—or write directly to TRANE, La Crosse, Wisconsin.

CHECK THESE FEATURES:

- **Easy to install**—Smaller dimensions for easy handling. Internal wiring completed, with low voltage circuit that's easier, safer to work with. Readily accessible water piping connection (on water-cooled models). Sturdy construction, with components mounted on independent frame . . . no strain on external cabinet.
- **Easy to service**—All components easily accessible from front panel. Removable refrigeration cycle can be serviced in field, or entire unit may be easily removed for in-shop repair or exchange.
- **Streamlined appearance** — Modern lines and new design blend with office or store decoration. Equally well adapted for free-standing or recessed location. New decorative return air grille instead of conventional return air louvers. Low heights for balcony, roof or suspended installation.
- **Quiet operation** — New, large slow-speed fans with adjustable belt drive for extra quiet air movement. All moving parts isolated, with spring-mounted compressor that absorbs vibration. Casing insulated throughout.
- **Flexibility**—Complete range of sizes, types. Water-cooled, air-cooled and evaporative condenser models. 3 to 30-ton capacities. Both vertical and horizontal rear discharge available by simple on-the-job fan rotation. Large, efficient fans with larger h.p. fan motors give full air capacity—even with long duct runs.

For any air condition, turn to

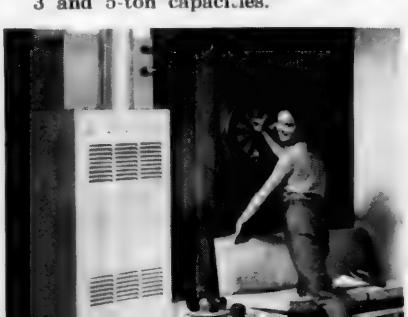
TRANE

MANUFACTURING ENGINEERS OF AIR CONDITIONING,
HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

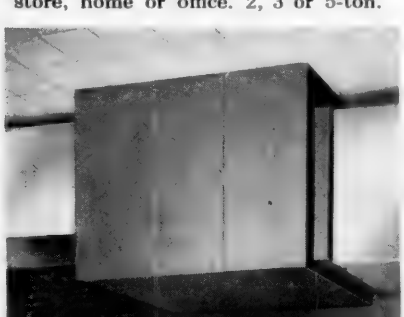
THE TRANE COMPANY, LA CROSSE, WIS.
SCRANTON MFG. DIV., SCRANTON, PA. • CLARKSVILLE MFG. DIV., CLARKSVILLE, TENN. • TRANE COMPANY OF CANADA, LIMITED, TORONTO • 97 U. S. AND 19 CANADIAN OFFICES

There's a Trane Climate Changer unit to cool any home, store or office!

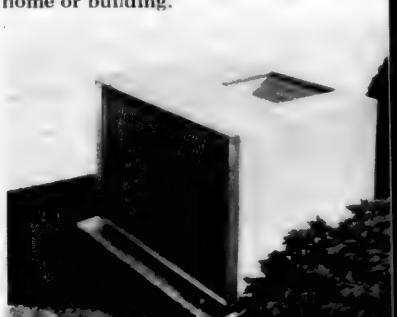
Heat and cool with this new Climate Changer combination unit. Warm air furnace in both oil and gas-fired models . . . complete range of sizes and types. Cooling section available in 2, 3 and 5-ton capacities.



Save space with this compact Fan-coil Climate Changer! Tucks away in attic, closet, utility room—or may be installed behind partition or under ceiling. Provides crisp, cool air for store, home or office. 2, 3 or 5-ton.



No water needed! These TRANE Climate Changers are air-cooled, eliminating water supply and disposal problems. Compact condensing unit is located outside the home or building.



how the *Peer* is put in *Peerless Electric*®

• Peerless Electric Roof Ventilators and all other Peerless Electric Air Moving Units must operate smoothly and quietly. Each one is electronically checked for dynamic balance while in actual operation. The meter board checks out each unit's motor for amps and allowable current ratings. NEMA and AMCA specifications are met and exceeded.

SEE OUR CATALOG IN SWEET'S

WRITE TODAY FOR CATALOGS!

FAN AND BLOWER DIVISION

THE *Peerless Electric*® COMPANY

Also Manufacturing The Massachusetts Line®

WARREN, OHIO

Member of the Air Moving and Conditioning Association, Inc. (AMCA)

THE BIG ONES COME TO BURNHAM

NASSAU COUNTY OFFICE BUILDING — GARDEN CITY, N. Y.

CHAPMAN, EVANS & DELEHANTY.....*Architects and Engineers — New York City*
V. L. FALOTICO & ASSOCIATES.....*Engineers — Brooklyn, N. Y.*
BERWIND & CO., INC.....*Heating, Ventilating and Air Conditioning Contractors — Garden City South, N. Y.*

BURNHAM'S "COMPACT" STEEL BOILERS HEAT LONG ISLAND'S "OFFICE BUILDING OF THE YEAR"

In shipment, the 3 Compact-Type Boilers, each of 20,000 sq. ft. steam net SBI rating, travel to Nassau County on *one* railroad flatcar. Here's visual evidence of their space-saving compactness.

Considered the largest and finest office building constructed on Long Island, N. Y. in 1958, the ultra-modern Nassau County Office Building uses 3 Burnham Compact-Type Boilers. Proved in 25 years' service, this reliable, highly efficient Burnham design compresses maximum heating capacity into *minimum floor space.* Consider it on your next job where space-saving is important. These welded steel Compact-Type Boilers are available in capacities from 2,600 to 35,000 sq. ft. E.D.R. net steam, SBI, with comparable ratings for water.

Burnham also offers a complete line of *Scotch-Type* and *Scotch-Type Package* Boilers in the above ratings and in certified ratings with up to 4,000 sq. ft. of heating surface.

Burnham Corporation

Steel Boiler Department
Irvington, New York

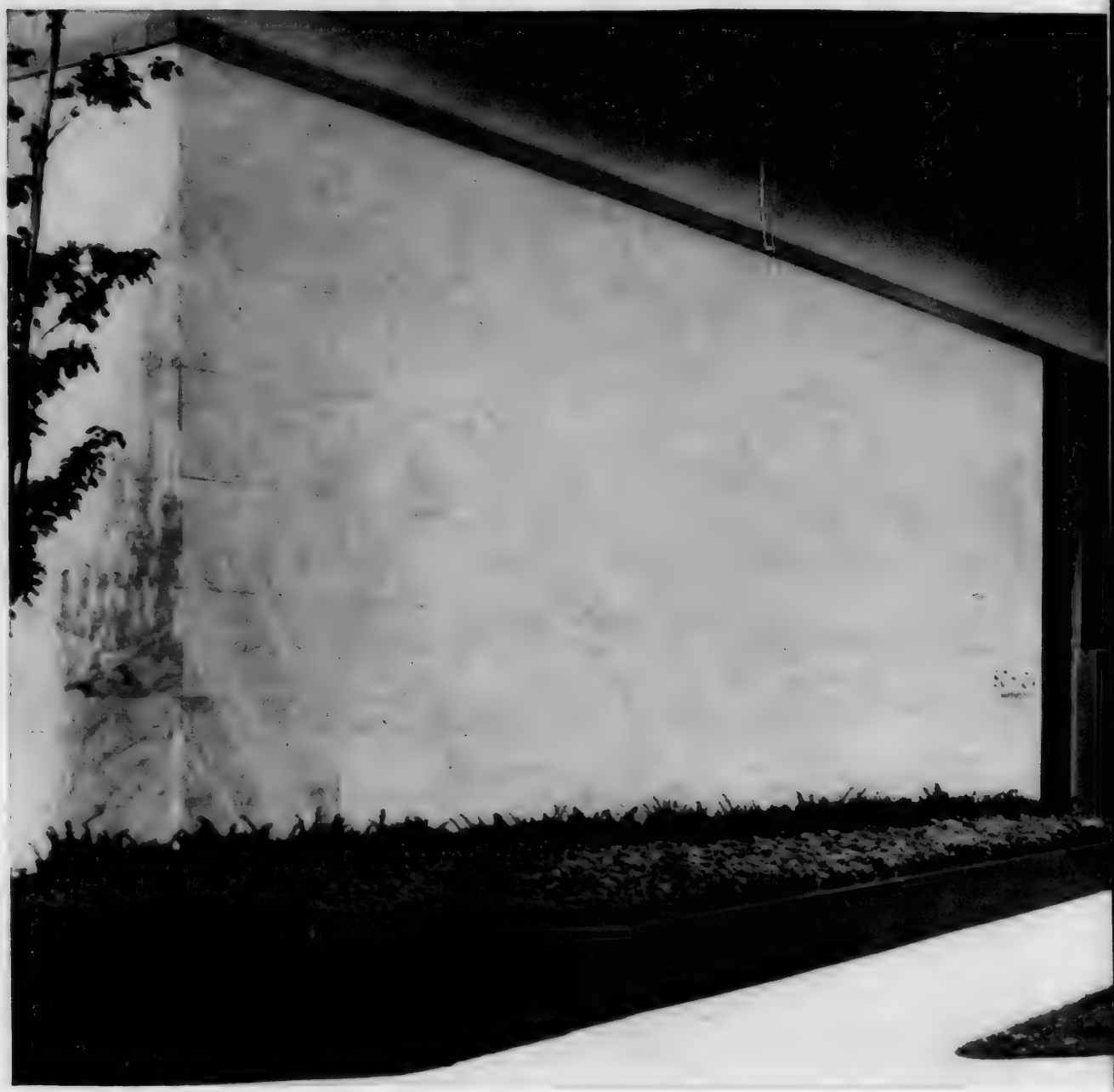
MEMBER

Sales Representatives throughout the U.S.A.

Burnham Corporation ACH-39
Steel Boiler Dept.
Irvington, New York

Please send me, without obligation, full ratings and data on:
Compact Boilers ☐ Scotch-Type Boilers ☐ Boiler-Burner Packages ☐

Name .....
Address .....
City ..... State .....



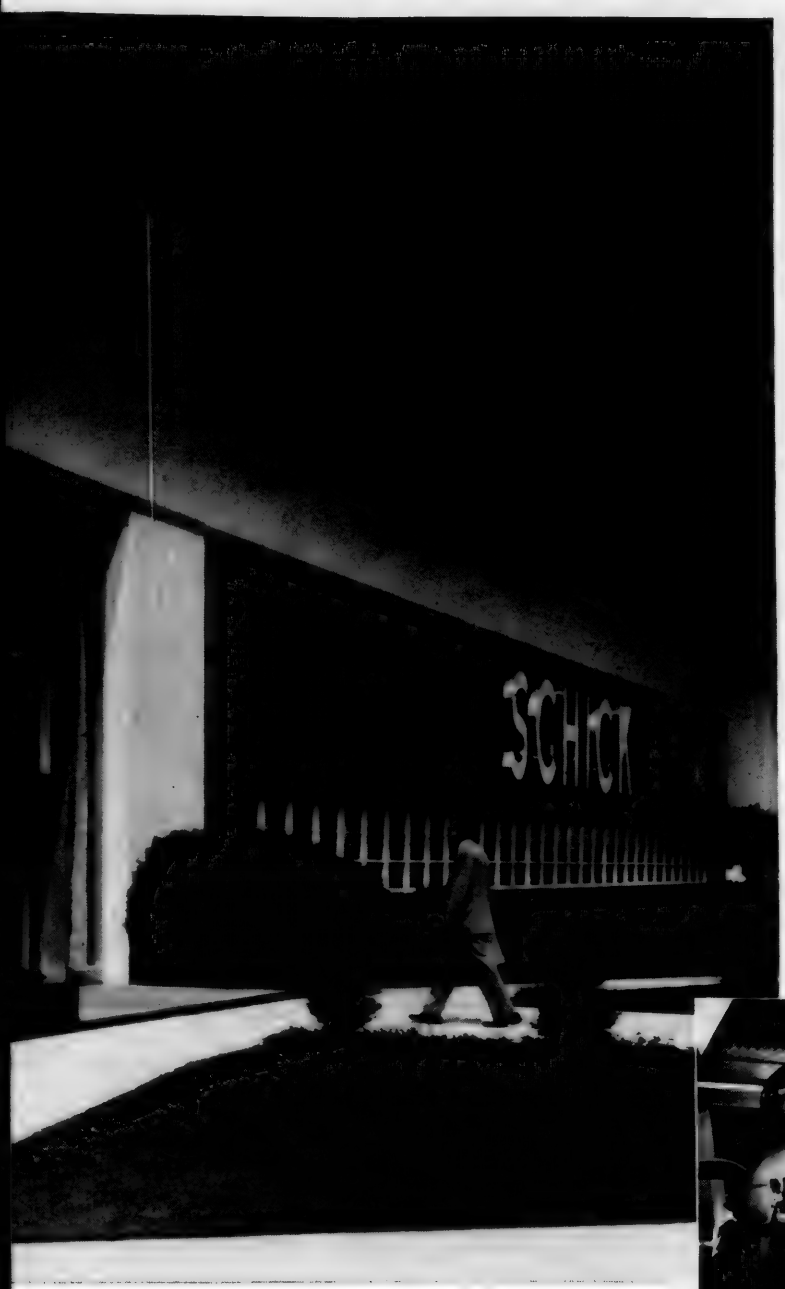
"We get all-year humidity control at low cost...thanks to GAS-operated CARRIER absorption refrigeration"

Thomas M. Garry, Schick Incorporated

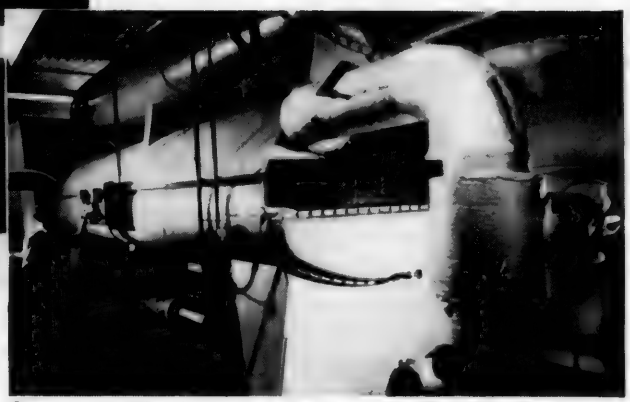
VICE-PRESIDENT OF MANUFACTURING

"We needed refrigeration equipment which would give exact humidity control all year 'round to minimize rusting of the highly-polished parts used in making shaving heads. Our 595 ton gas-operated Carrier Absorption Refrigeration unit does the job with top efficiency...and provides comfort cooling for the entire plant at low operating costs."

The Carrier Absorption unit uses ordinary tap water as a refrigerant. No prime mover is required, only low pressure steam or hot water. Seasonally idle boilers can be put to use all



Pioneer producer of electric shavers, Schick Incorporated, occupies this modern, efficient, and completely air-conditioned building in Lancaster—heart of the Pennsylvania Dutch country.



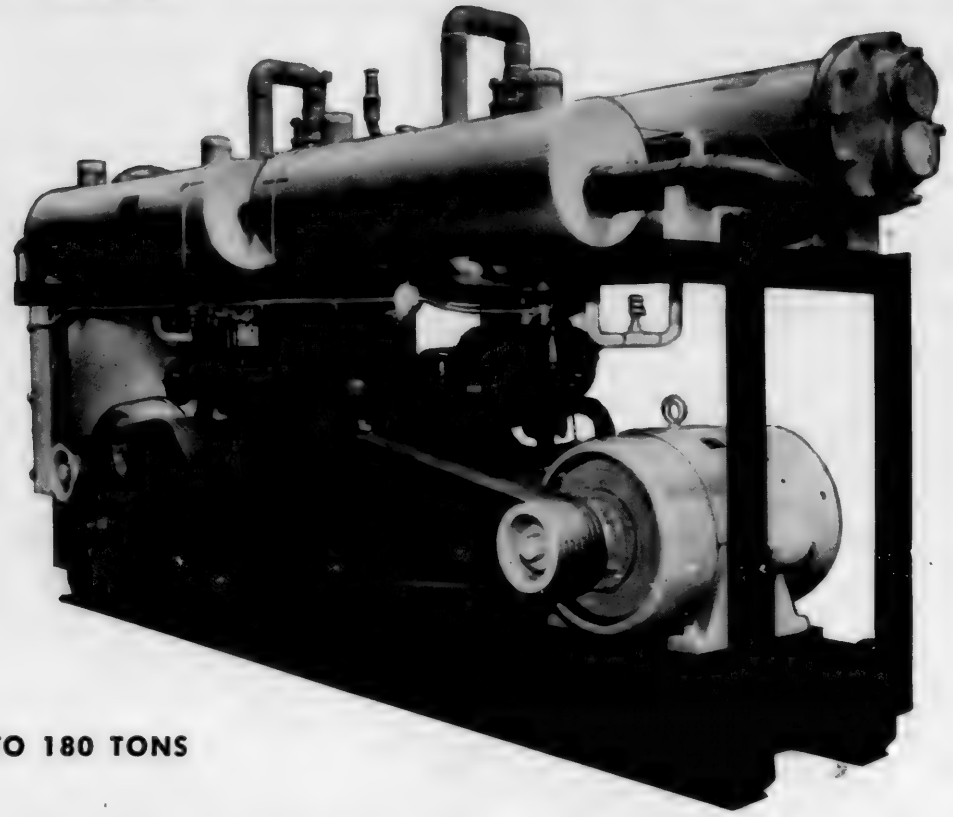
Gas-operated Carrier Automatic Absorption Refrigeration

- cuts operating expenses
- minimum maintenance required
- low installation cost
- adjusts automatically to cooling load
- compact and light weight

year around...and with gas as the boiler fuel, operating costs are cut to a minimum. Low maintenance is another substantial savings, since there are no major moving parts to get out of order, need replacing or repair.

Because of low installation, operating and maintenance costs, the gas-operated Carrier Automatic Absorption units can be the source of important savings. For full details, call your local gas company, or write to the Carrier Corporation, Syracuse, New York. *American Gas Association.*

THE FRICK PACKAGED WATER CHILLER



20 TO 180 TONS

COMPACT • AUTOMATIC • EASILY INSTALLED

A COMPLETELY ENGINEERED, PACKAGED LIQUID CHILLER . . . INCORPORATING ALL OF THE COMPONENTS IN ONE UNIT.

Each chiller is factory-assembled on a rigid steel base, balanced, and tested, ready for easy installation. Refrigeration is supplied by the famous Frick "ECLIPSE" compressor, with condenser-receiver. Machines handle either refrigerant 12 or 22. Automatic controls adjust the liquid supply and compressor capacity to assure economical operation at all times. Safety features such as oil-pressure switch, high-low pressure cut-outs, freeze-up control on chiller, and two-stage thermostat for automatic regulation of liquid and compressor, are all standard on Frick liquid chillers.

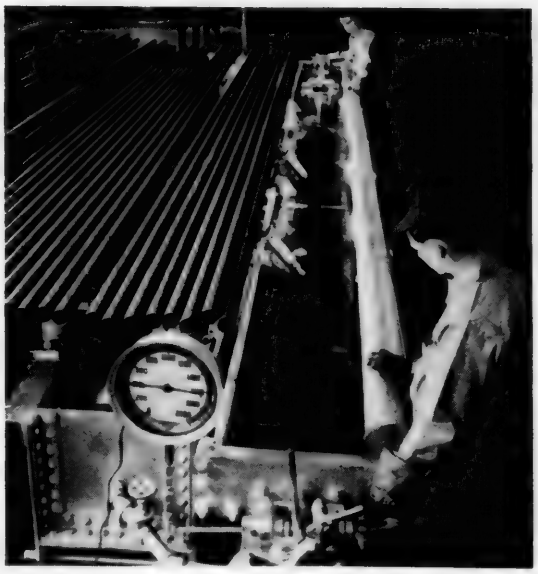
WRITE FOR FRICK BULLETINS 802 AND 804

FOR COMPLETE DATA . . . facts and figures, call your nearest Frick Branch or Distributor. Consult the Yellow Pages of your phone directory, or write direct to . . . . . .

DEPENDABLE REFRIGERATION SINCE 1882
FRICK CO.
WAYNESBORO, PENNA., U. S. A.

Architects & Engineers: L. J. Hosman and R. F. Hastings, Detroit. Consultants: Smith, Hinchman and Grylls, Inc., Detroit. General Contractor: J. H. Pomeroy & Co., Inc., San Francisco, Los Angeles. Mechanical Contractor: J. B. Nettles & Co., Inc., San Francisco. Sprinkler Contractor: Rushlight Automatic Sprinkler Co., Portland. Pipe Jobbers: Grinnell Co. of the Pacific, Los Angeles; Keenan Pipe & Supply Co., Los Angeles.

Under this 23-acre roof . . . 1,053 tons of Bethlehem Steel Pipe



Our buttweld pipe is made on modern continuous-weld mills. Each length of pipe is hydrostatically tested to assure quality.

Recently completed in East Los Angeles, here's one of the largest and most modern automobile assembly plants ever built by the Ford Motor Company. Designed for a two-shift production day—and with an eye to economy—the plant is serviced by hundreds of miles of Bethlehem steel pipe.

Experience had shown the designers that steel pipe gives the most service for the least expense. So they specified steel pipe in diameters from ¼ to 12 in. for the plumbing, heating and gas lines, for the compressed air piping, and for the automatic sprinkler system.

When you next have a piping job, you'll come out ahead if you use Bethlehem steel pipe. Beth-Co-Weld continuous buttweld pipe (up to 4 in. nominal) and Bethlehem electric resistance-weld pipe (from 5-9/16 to 16 in. OD) will help you make a profit—and will give your customer what he wants.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem Products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corp.

BETHLEHEM STEEL

BETHLEHEM STEEL

This look kills sales . . .

The following manufacturers have signed up and are participating in the program:

Airtemp Division, Chrysler Corporation • Amana Refrigeration, Incorporated • American Blower Division of American Radiator and Standard Sanitary Corporation (American-Standard Industrial Division) • American Furnace Company • Arkla Air-Conditioning Corporation • Bryant Manufacturing Company, Division of Carrier Corporation • Carrier Corporation • Curtis Manufacturing Company • Day and Night Division, Carrier Corporation • Friedrich Refrigerators, Inc. • General Automatic Products Company • General Electric Company • Gibson Refrigerator Company, Division of Hupp Corporation • Hall-Neal Furnace Company • International Heater Company • Lennox Industries, Inc. • The

This seal saves them . . .

How many times have you seen this look?
The customer's heard so many conflicting claims for unitary* air-conditioners in terms of "horsepower," "cubic feet," "btu's" and "tons," he doesn't know what to believe. He gets That Look. He backs away, muttering, "I'll think about it." You know what that means. No Sale.
How many times have you said, "Something ought to be done about this."? Now, something *has* been done about it.
And here it is. The ARI Seal of Certification . . . the integral part of an industry-wide program developed by the Air-Conditioning and Refrigeration Institute in cooperation with the National Warm Air Heating and Air Conditioning Association, for unitary equipment with a maximum capacity of 135,000 btu's. Here's how this program works, to help you:

1. ENDS CONFUSION, MAKES SELLING EASIER. Every participating manufacturer (and there are now 33 of them, producing over 80% of total U. S. unitary equipment), will have the Seal of Certification on his models. This certifies that the unit's rated capacity is in accordance with ARI Standard 210-58 for electrically-driven equipment or ARI Standard 250-58 for heat-powered equipment; it also meets other important minimum performance requirements of the Standards. With a uniform standard of rated capacities and performance to talk about, you'll be able to give customers a clearer picture. And they'll be able to make a definite decision to *buy*, because they can now compare units by one uniform standard.

2. RESTORES PUBLIC CONFIDENCE IN THE INDUSTRY. Your customers will like the idea that their investment in your product is backed not only by the integrity of the manufacturer . . . but also by the industry's trade associations.

3. SAFEGUARDS YOU, AND ALL OTHER REPUTABLE MEMBERS OF THE INDUSTRY. The Seal of Certification gives you a big selling edge over "fast buck" dealers and units with claimed capacities not established in accordance with proper industry standards. Now you'll have a real "talking point" for quality products.

4. THE INDUSTRY BECOMES SELF-REGULATORY. There are checks and double-checks all along the way. There'll be random testing of units by an independent testing laboratory, with results reported to ARI. Participating manufacturers will also check each other's equipment and report to ARI. Any unit which does not come up to ARI standards as stated, will lose the protection of the Seal of Certification, unless the defect is remedied. And, since participating manufacturers have signed up on a firm contract basis, this provides proper means for enforcement.

5. INCREASED SELLING POTENTIAL. A Directory of participating manufacturers is now available. Supplements will be issued monthly, as required, listing new models and additional participants. This directory is already in the hands of over 13,000 engineers, architects, building contractors, mortgage brokers and members of government agencies. These are key individuals, who influence the purchase of millions of dollars worth of unitary air-conditioning equipment for projects on local, state and national levels. In addition, there is an explanatory brochure, which presents the complete ARI program in detail. Both booklet and Directory are free, and will be invaluable in influencing your customers.

All certified units must pass the following tests, in addition to being rated at Standard Rating Conditions set forth in the applicable ARI Standard.

A. Maximum operating conditions test
B. Low temperature operation test
C. Insulation efficiency test
D. Condensate disposal test
E. The unit must meet these requirements while operating against specified minimum external airflow resistance to allow for connected duct work.

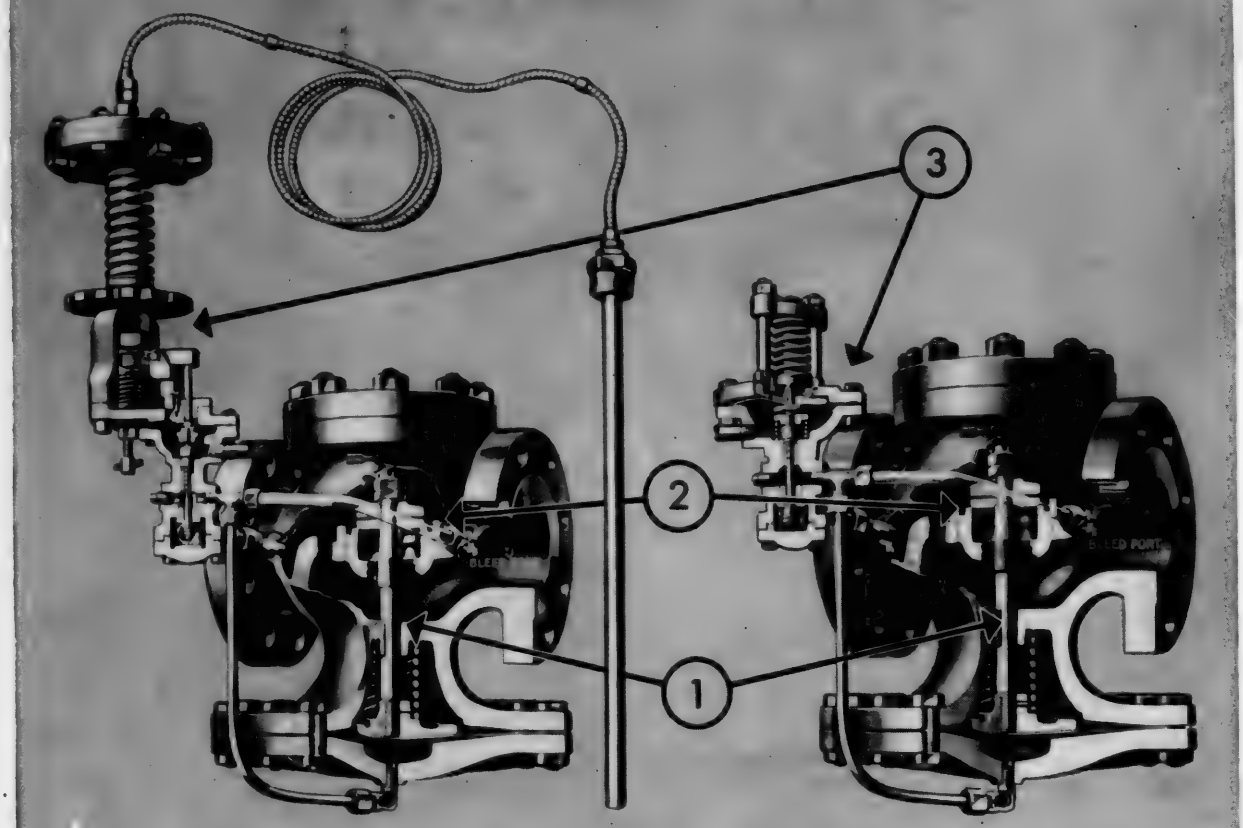
For your free copy of the Directory and explanatory booklet, write to: Chief Engineer, Dept. B-3, Air-Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N. W., Washington 6, D. C.

*"Unitary" air-conditioners are described as all packaged air-conditioners (whether in single units or in combined units called "split" systems), but not including room air-conditioners or heat pumps.

Majestic Company, Inc. • The Mathes Company, Division of the Glen Alden Corporation • Mueller Climatrol, Division of Worthington Corporation • National-U. S. Radiator Corporation • The Payne Company, Division of Carrier Corporation • Peerless Corporation • Perfection Industries, Division of Hupp Corporation • Rheem Manufacturing Company • Round Oak Company of Indiana, Incorporated • A. O. Smith Corporation • The Trane Company • Typhoon Air Conditioning Company, Division of Hupp Corporation • United States Air Conditioning Corporation • Utility Appliance Corporation • Westinghouse Electric Corporation • Worthington Corporation • York Division, Borg-Warner Corporation

VALVE TIPS:

3 Tips for Low Maintenance in Automatic Regulating Valves



Spence ET124 Temperature Regulator

Spence ED Pressure Regulator

No engineer has to be told that downtime of regulating valves is costly—and a nuisance.

Nowadays the men who keep these valves operating want to make sure they aren't stuck with a maintenance headache for the life of their valves. That's why we are outlining this simple check list which covers three important features which keep maintenance costs down.

1. Stuffing boxes are probably the number one time consumer in valve maintenance. No matter how you figure it, repacking stuffing boxes is costly.

That's one reason Spence uses a "balanced" diaphragm construction which eliminates stuffing boxes. Simple stem guiding and large metal diaphragm operation reduce sticking and binding to a minimum.

2. Another problem is replacement of seats and discs when they've been cut by steam. Today you can forget about this problem entirely by insisting on an unconditional guarantee against wiredrawing. Spence, for instance, uses SECO Metal seats and discs and gives such a guarantee.

3. Any valve designed to control temperature and pressure within tight limits can be affected by dirt in the steam lines. You can't get a guarantee against this, but you can specify a valve that makes trouble shooting easy. Here's the tip:

Make sure your regulating valve is controlled by an external pilot. If trouble develops, it is easy to find out if it is in the pilot or the main valve with a simple test.

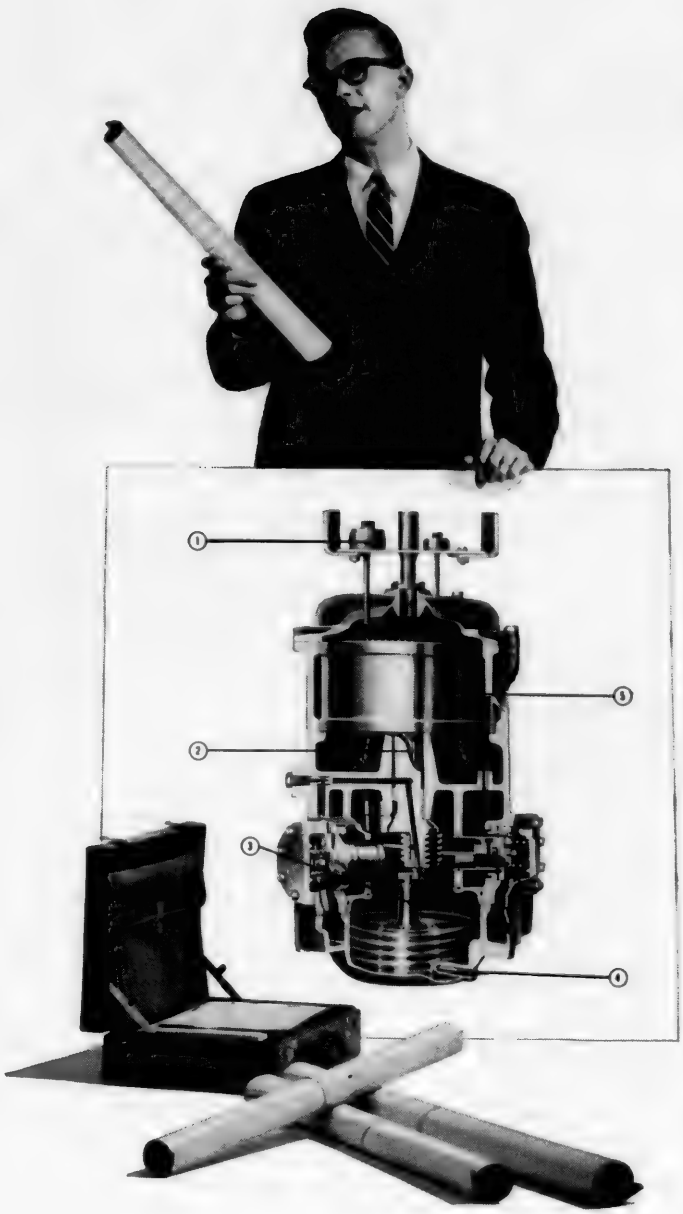
If the trouble is in the pilot, you can remove it without taking the main valve out of the line.

The quickest way to get the regulator working again is to install a spare pilot. This is easy—and in the Spence design it is not expensive to carry spare pilots. Spence pilots fit all sizes of Spence main valves.

These maintenance advantages plus other advanced features are available in a wide range of Spence automatic regulating valves. For more information write for the Bulletin TE.

SPENCE ENGINEERING COMPANY, INC.
Walden, New York

SE-144

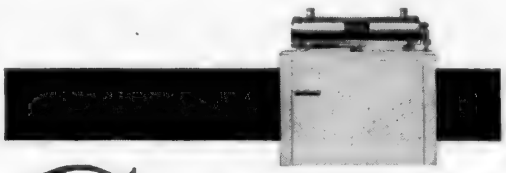


Here are 5 of the 18 reasons why it pays to pick Chrysler Liquid Chillers

Cooling for comfort? Or cooling a process? Only Chrysler Airtemp SW Liquid Chillers offer so many exclusive engineering advantages. Take the hermetically-sealed radial compressor, for example. You get:

1. *Floating power.* Rubber-in-sheer suspension absorbs vibration. Noise is gone . . . and so are vibration-caused service headaches.
2. *Direct drive.* No belts, no pulleys, no seals to break down. You get greater efficiency, less noise from a more compact package.
3. *Positive lubrication.* Exclusive pressure pump is sealed in a bath of oil. Moving parts get constant lubrication for long, trouble-free life.
4. *Crankcase heater.* Prevents refrigerant from condensing and diluting lubricant. Oil stays clean . . . and always ready to flow.
5. *Sealed-in motor.* Dust-proof for longer service life. Directly connected to dynamically balanced crankshaft to cut weight and operating costs.

The rest of the 18 reasons? They include innerfin direct expansion chiller, automatic control panel, easier installation and . . . But why not get the complete story from your local Chrysler Applied Machinery and Systems sales office. Or write: Airtemp Division, Chrysler Corporation, Dept. I-39, Dayton 1, Ohio.



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UNDERGROUND HOT PIPE PROTECTION

Specify and Use.....

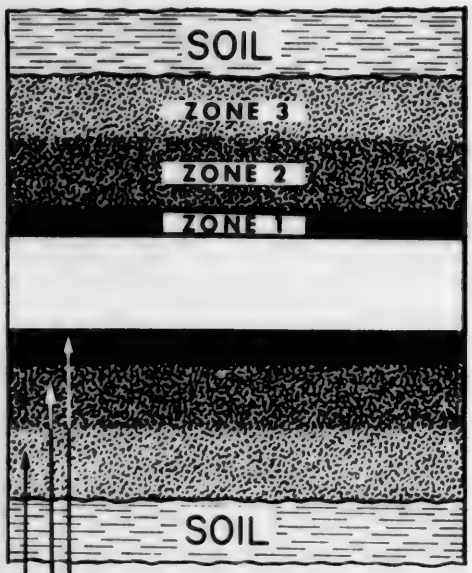
TRI-SUL-ITE

3-WAY PROTECTION SYSTEM *

THE ZIEGLER GILSONITE MINERAL

Looking for an underground piping system that's free from excessive heat loss... yet gives the greatest protection possible from corrosive soil conditions? A system with a low installation cost and minimum maintenance expense? Then TRI-SUL-ITE 3-way protection system is your answer. TRI-SUL-ITE installations have proven to be the speediest... easiest... surest underground pipe protection. TRI-SUL-ITE, a specially selected gilsonite, is poured under and around all pipes in the trench. After proper curing, it forms three zones of protection against water, corrosion and heat loss.

Close-up photo illustrates the plastic zone of TRI-SUL-ITE peeled back to show excellent adhesion for pipe protection.



*** ZONE 1 PROTECTION: PERMANENT WATER BARRIER**

The first zone of TRI-SUL-ITE adjacent to the pipe, fuses from pipe heat into an impermeable, waterproof coating. It resists normal soil acids and alkalis. When it is plastic the pipe movement is contained within this zone. The first zone of TRI-SUL-ITE protection gives positive assurance that water cannot follow the grade of the pipe.

*** ZONE 2 PROTECTION: EXCELLENT INSULATOR**

The second zone consists of the edges of the TRI-SUL-ITE granules fused to isolate the air spaces, resulting in a highly effective insulator which minimizes heat losses to the soil.

*** ZONE 3 PROTECTION: INSULATOR AND WATER BARRIER**

The third zone of TRI-SUL-ITE granules is not fused by heat and provides maxium insulating efficiency plus good resistance to water penetration and protection against surface shocks and subsoil stresses.

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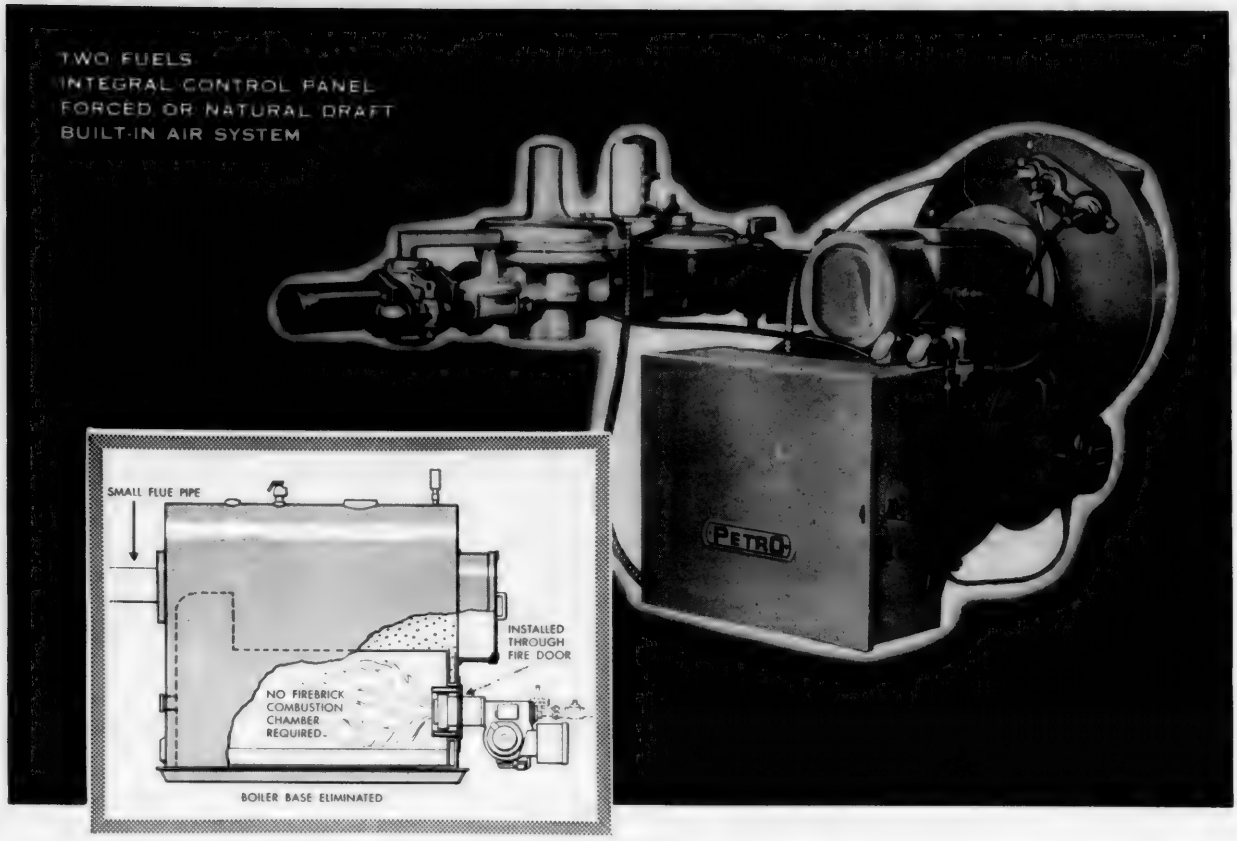
New all-in-one burner *bolts to boiler front*



Average installation saving in firebox boilers: $250

Substantial savings in installation costs are made possible in a firebox boiler by the elimination of the boiler base and fire brick combustion chamber. Fits any boiler; bolts to the boiler front. Complete forced draft, fuel and control systems are built into the burner. No secondary air construction needed.

Also available as boiler-burner unit

Packaged boiler with integral burner can be delivered at site, ready for service connections. No brickwork, pit, or special setting required.

No high stack needed

In a sealed fire box no stack is required; merely a vent. Air is supplied under forced draft. In conventional boilers the stack can be shorter and smaller than required by the usual gas or oil burner.

Switches fuels instantly

Burns either fuel with high efficiency. Saves purchase of extra burner in areas where gas users must provide standby oil equipment. One-fuel models are also available for either gas or oil.

Cuts fuel costs

New type of burner head and improved fuel-air control develops exceptional combustion efficiency. Instant heat absorption. No wasteful refractories to heat up.

Costs less to operate

Requires no more supervision than a domestic burner. Maintenance problems are negligible, and can usually be handled by the janitor.

Capacities: oil, 4 to 30 gph; gas, 500,000 to 4,000,000 btu/h.

Send coupon for full description and specifications

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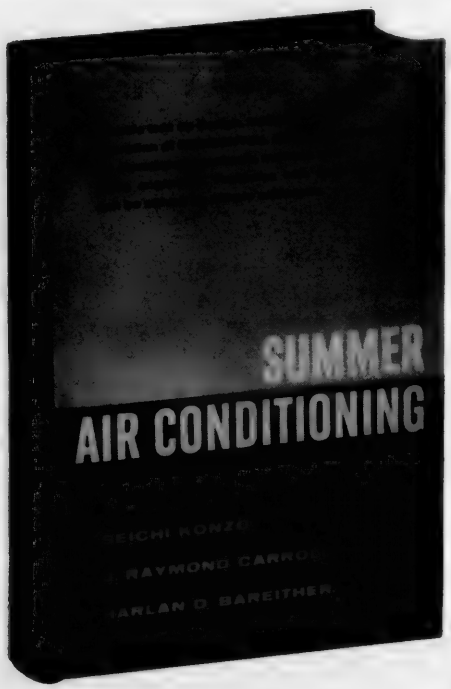

SUMMER AIR CONDITIONING by S. Konzo, J. R. Carroll and H. D. Bareither of the Mechanical Engineering Department, University of Illinois

Summer Air Conditioning is a basic what-how-and-why book on *residential air conditioning* written to provide a much-needed training text and reference book for all who design, sell, install or operate air conditioning systems and equipment for houses and small buildings. Prepared at the request of the U.S. Armed Forces Institute, it contains problems and exercises for each chapter which help check the reader's understanding of the material. No problem calls for more than a common knowledge of arithmetic. For certain operations, the book shows how to use pre-calculated tables which make even simple multiplication unnecessary.

- All industry methods, including those recommended by engineering and trade associations, are taken into account in presenting selected procedures.
- Simple diagrams show essentials of mechanisms and principles of operation.
- Technical detail — included only when necessary — is broken down into simple components that can be understood even by a newcomer in the field.
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Right now, in the growing air conditioning field, it is important to train competent people rapidly to do the job of selling and installing equipment and systems. SUMMER AIR CONDITIONING explains simply and clearly how and why things are done and what makes equipment operate the way it does.

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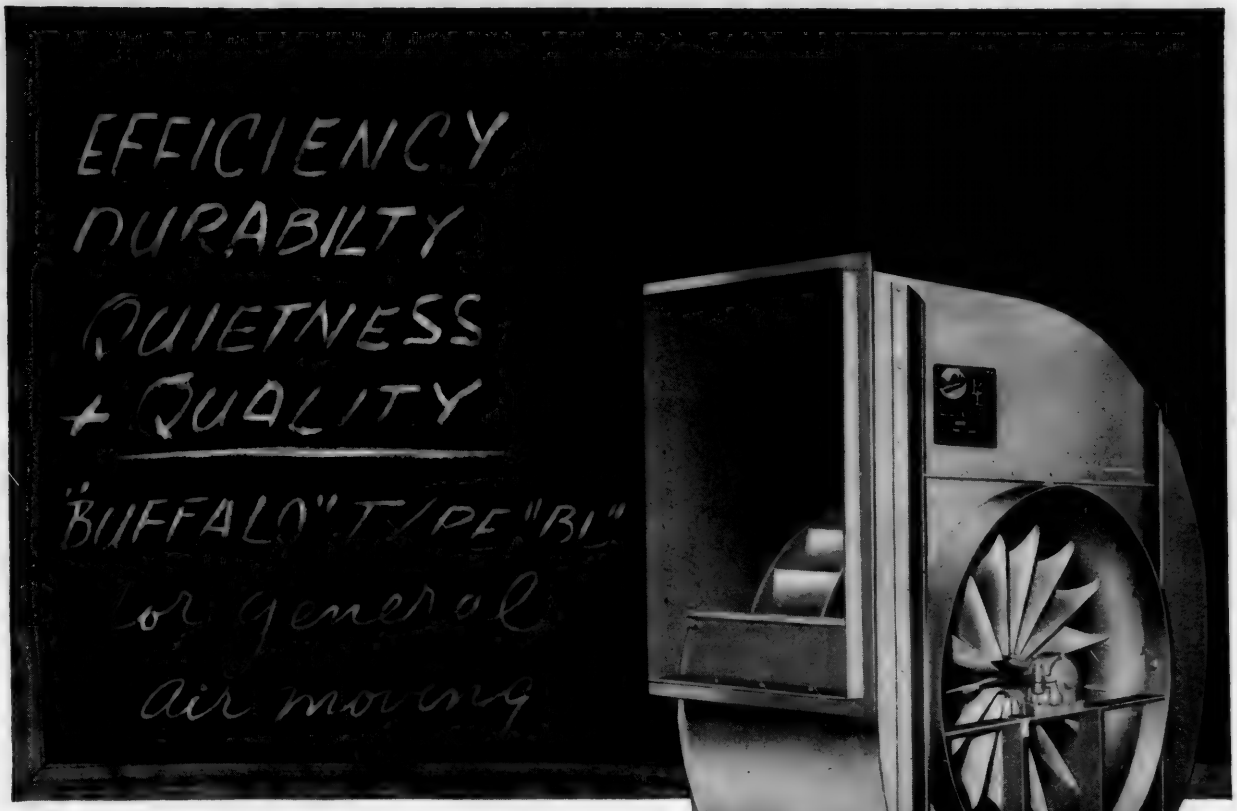

All the things you want for satisfactory air handling at moderate pressures are embodied in the "Buffalo" type "BL" Fan. High efficiency, quiet operation and quality of construction* lead to unparalleled durability on the job. Here are several of the reasons why you will be more than satisfied with this well engineered fan:

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For complete details on the "Buffalo" Type "BL" Fan Series, contact your "Buffalo" engineering representative. Or write direct for Bulletin F-104.

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Big warehouse keeps warm with four heaters

This 79,000 square foot warehouse of the C. A. Turner Company, Rankin, Pa., has high roof areas and large access doors. Yet, only four Dravo *Counterflo* heaters were needed to maintain a 68° comfort level during last January's severe cold spell with its frequent sub-zero temperatures. Fuel costs for the month were 7/10¢ per square foot!

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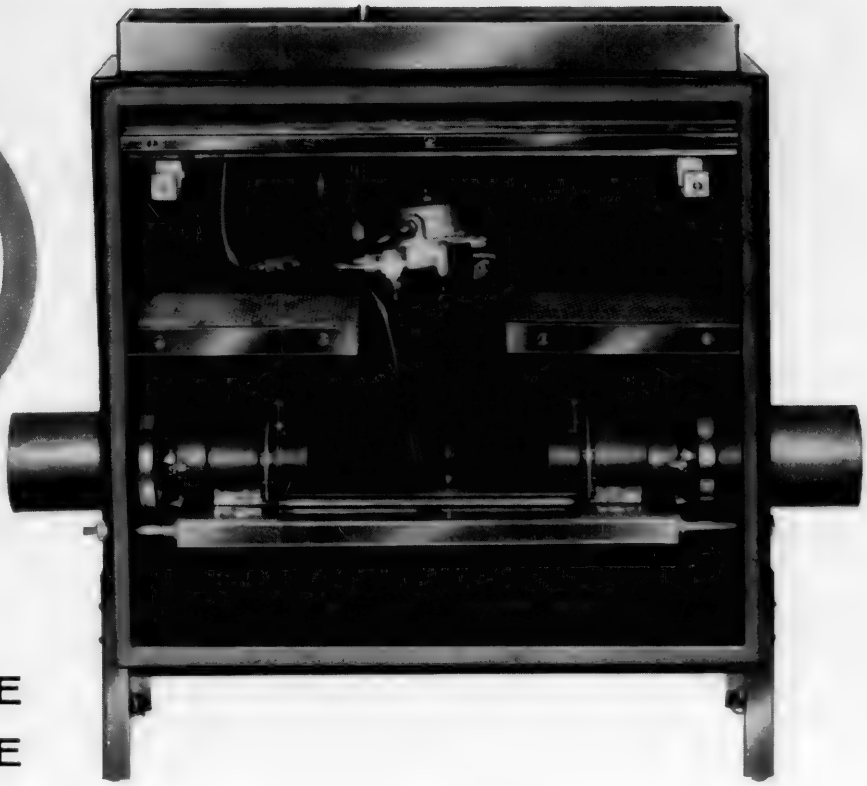
CON-VOL EQUIPPED HIGH VELOCITY UNITS

CONSTANT VOLUME UNDER ALL CONDITIONS



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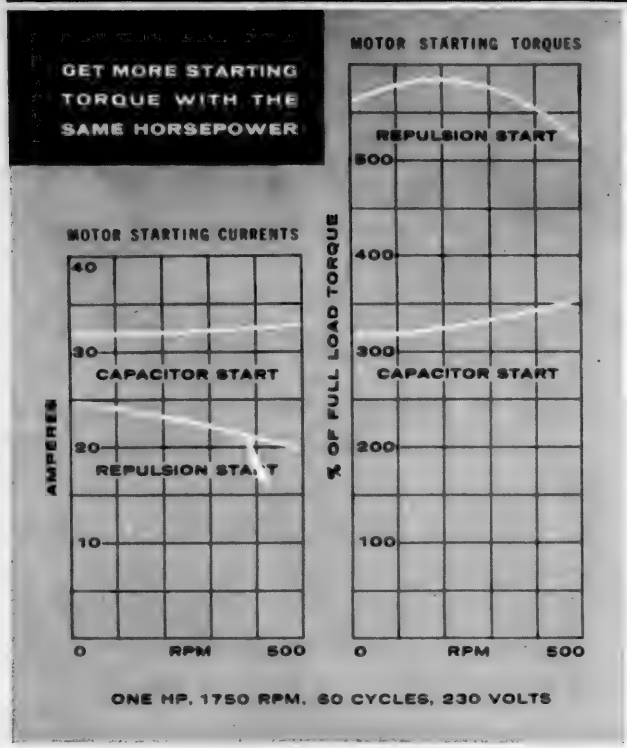

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Starting heavy loads is a natural for Wagner Type RA Motors. Widely used for high starting torque applications, like farm machinery, compressors, pumps and grinders, this rugged single phase motor requires very low starting current that minimizes light flicker. You get smooth performance with a constant high operating speed, even under overload, and a flat efficiency curve over a wide operating range.

You practically eliminate service problems when you power tough single phase applications with these motors. They have unmatched ability to start high inertia or heavy friction loads repeatedly and they give many years of unfailing service.

You can get these motors from leading motor distributors in your community or through Wagner Sales Offices in 32 principal cities. Your Wagner Sales Engineer will be glad to help you select the right motor for your application. Wagner Bulletin MU-220 gives full details on Repulsion-Start-Induction Motors.

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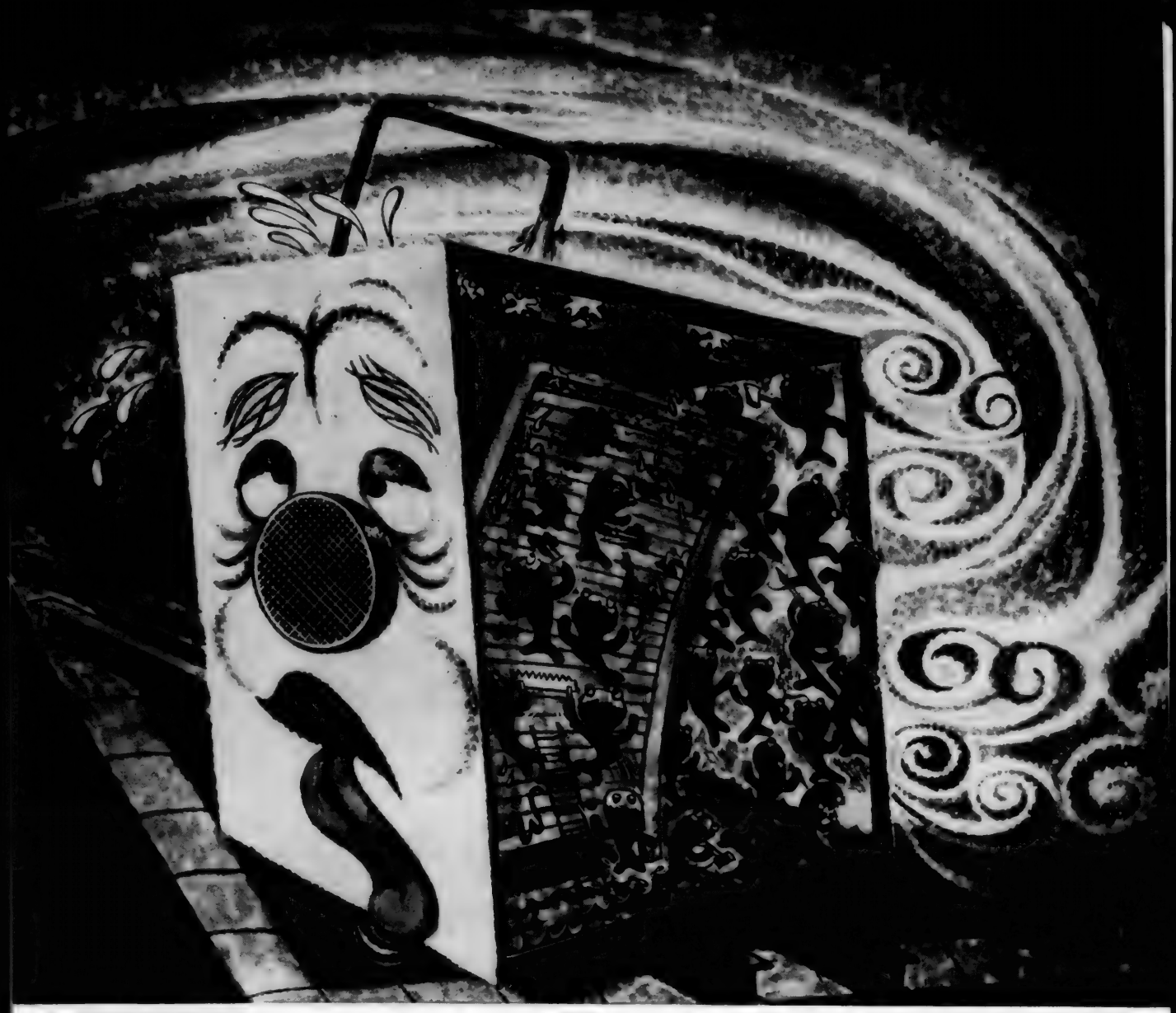

BEFORE YOU BUY, THINK:

Will fungus attack your cooling tower 2 years from now?

Not if it's a Halstead & Mitchell cooling tower with a 20-Year Guarantee

The specially treated wood decking in H&M towers resists rotting, fungus attack and algae which accumulates and obstructs air flow in most other towers. Performance remains "like new" in H&M cooling towers year after year.

Only Halstead & Mitchell offers a 20-Year Guarantee on the wetted deck against failure due to rotting or fungus attack.

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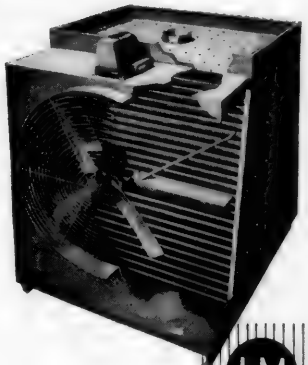

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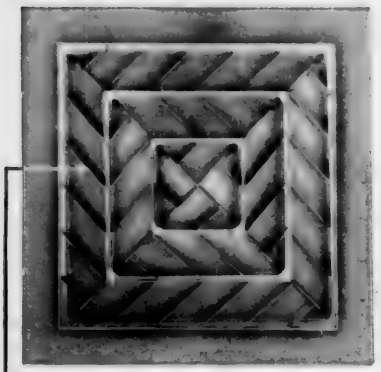
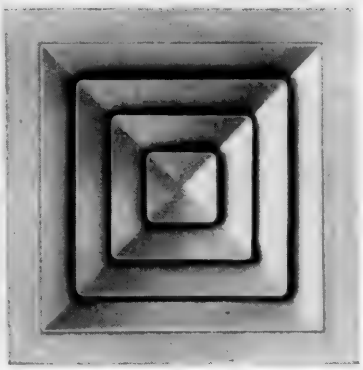
AGITAIR Diffuser



These AGITAIR DIFFUSING VANES provide 64 active air jets to every square foot of the diffuser.

Most Copied Design



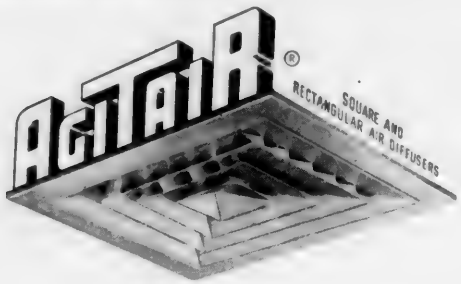
AGITAIR originated square and rectangular designed diffusers.

AGITAIR unequaled performance efficiency ...job-proven more than 1,000,000 times

Air Devices Inc., engineers designed, developed and pioneered the application of AGITAIR square, rectangular air outlets with built-in diffusing vanes to replace the use of unpredictable air distribution from vaneless plaques.

Today, more than 1,000,000 AGITAIR custom-made square and rectangular diffusers are installed on thousands of applications in all kinds of business.

AGITAIR diffusers provide 100% draftless air distribution from any location in the ceiling or sidewall with blows in 1, 2, 3 or 4 directions and with no stagnant areas in the conditioned spaces. No blank offs.



The vane and louvre construction of AGITAIR square and rectangular air diffusers produces counter-flowing air streams or jets (64 to a square foot). This action induces movement of all room air toward the diffuser while rapidly mixing the conditioned air with room air to assure instantaneous temperature equalization and draftless distribution. Plaques are incapable of performing these basic functions.

Every feature of these AGITAIR diffusers has been designed to assure complete users satisfaction. Appearance . . . performance . . . noiseless . . . draftless air distribution. For complete engineering data on these AGITAIR custom-made diffusers ask your local AGITAIR representative or write direct to Air Devices Inc.

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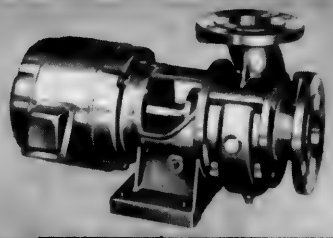
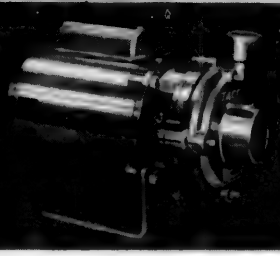
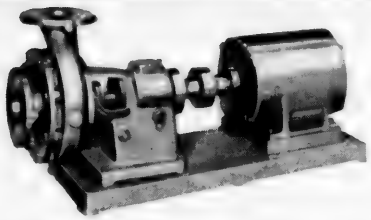


TACO LP PUMPS A complete line of standardized close coupled pumps of outstanding quality and performance for heating, air-conditioning and industrial applications.



TACO 170 CENTRIFUGAL PUMPS Perfect for cooling tower jobs; air-conditioning installations . . . wherever a small, top-quality built centrifugal pump is needed.



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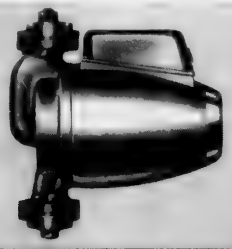

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TACO CIRCULATORS Packed with quiet power and proven performance, sizes ¼" through 3"

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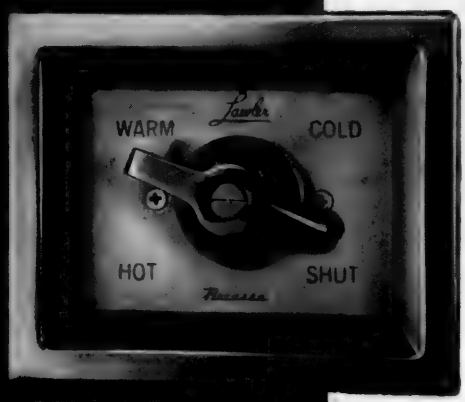

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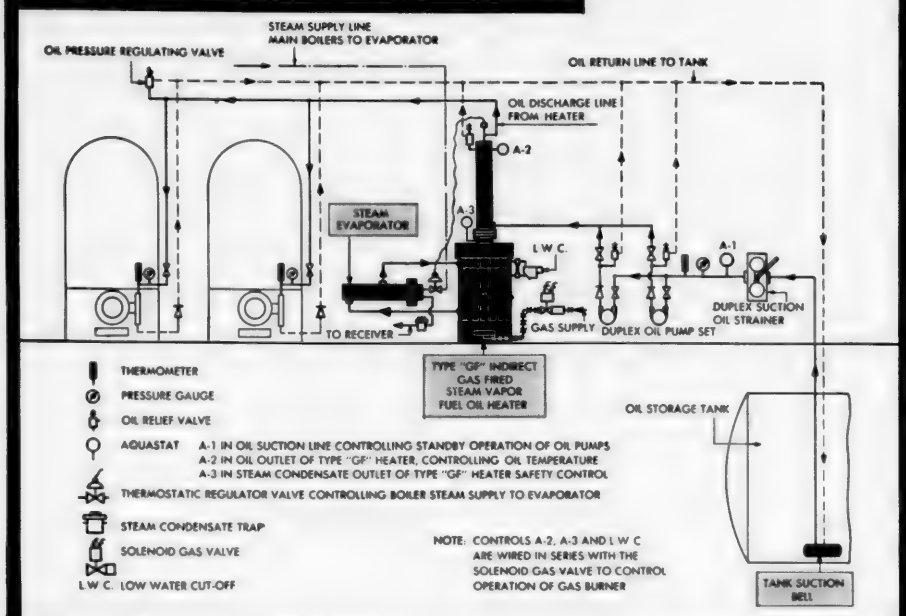
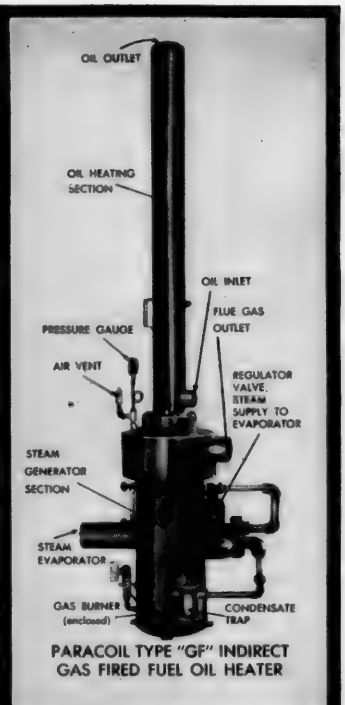

STEAM SUPPLY LINE
MAIN BOILERS TO EVAPORATOR
OIL PRESSURE REGULATING VALVE
OIL RETURN LINE TO TANK
OIL DISCHARGE LINE FROM HEATER
A-2
A-3
STEAM EVAPORATOR
L W C.
A-1
TO RECEIVER
GAS SUPPLY
DUPLEX OIL PUMP SET
DUPLEX SUCTION OIL STRAINER
TYPE "GF" INDIRECT GAS FIRED STEAM VAPOR FUEL OIL HEATER
OIL STORAGE TANK
THERMOMETER
PRESSURE GAUGE
OIL RELIEF VALVE
AQUASTAT A-1 IN OIL SUCTION LINE CONTROLLING STANDBY OPERATION OF OIL PUMPS
A-2 IN OIL OUTLET OF TYPE "GF" HEATER, CONTROLLING OIL TEMPERATURE
A-3 IN STEAM CONDENSATE OUTLET OF TYPE "GF" HEATER SAFETY CONTROL
THERMOSTATIC REGULATOR VALVE CONTROLLING BOILER STEAM SUPPLY TO EVAPORATOR
STEAM CONDENSATE TRAP
SOLENOID GAS VALVE
L W C. LOW WATER CUT-OFF
NOTE: CONTROLS A-2, A-3 AND L W C ARE WIRED IN SERIES WITH THE SOLENOID GAS VALVE TO CONTROL OPERATION OF GAS BURNER
TANK SUCTION BELL



PARACOIL TYPE "GF" INDIRECT GAS FIRED FUEL OIL HEATER

Preheat No. 6 Oil with Safety, using BOILER STEAM and AUXILIARY GAS-GENERATED STEAM Installation and Operation are less costly!

- ***High operation costs of an all-electric No. 6 oil preheating system can be avoided by use of the Type "GF" Indirect Gas Fired Fuel Oil Heater!***
- ***No flame is in contact with oil tubes! Gas is used to generate a supply of steam to heat the oil.***
- ***Secondary evaporator eliminates use of gas entirely when main boiler is operating.***
- ***High viscosity oils are always maintained at atomizing temperatures.***

cut along dotted line and save

The Problem

Many No. 6 fuel oil burner systems operate on weekdays only, shutting down in whole or part over weekends and holidays. In such installations, special facilities are necessary to maintain adequate oil temperatures during the standby hours to enable the burners to start promptly and easily when the working period resumes.

In a typical standby system, oil is circulated by intermittent pumping between the burners and the storage tanks and is heated either by periodic boiler firing or by an all-electric system. Both are effective—but boiler heating necessitates firing a large boiler under most inefficient conditions, while an electrical system is extremely costly both to install and operate.

The Solution

Fast, effective, economical standby heating can be provided by a Paracoil system employing a **gas fired heater** (Type "GF"), a **tank suction bell** and a **secondary steam evaporator.**

The Gas-Fired Heater. The Paracoil "GF" Heater always maintains oil in its oil heater section at the proper burning temperature. This heated oil is always available for immediate circulation when needed to maintain pumping temperature in the oil circulation lines or when required to start the oil burners. In addition to maintaining oil at the proper burning temperature, the "GF" heater combined with secondary evaporator serves as a safety device which isolates the oil heater from contact with the primary steam generating system. Thus it is impossible to contaminate the main steam system or boilers with oil in event of an oil tube failure.

Tank Suction Bell. Heated oil is recirculated to a suction bell in the storage tank. Here it mixes with and heats oil to be withdrawn, maintaining a ready supply of fuel at pumping temperatures at all times.

Steam Evaporator. When the main boiler is in operation, boiler steam enters the steam evaporator and generates secondary steam which then takes over the fuel oil heating load. Concurrently, the Type "GF" heater cuts out, thus conserving gas when steam is available from the main boiler.

Paracoil engineers have designed and built many safety-type oil preheating systems. Their experience and know-how is at your service. Write for further information.

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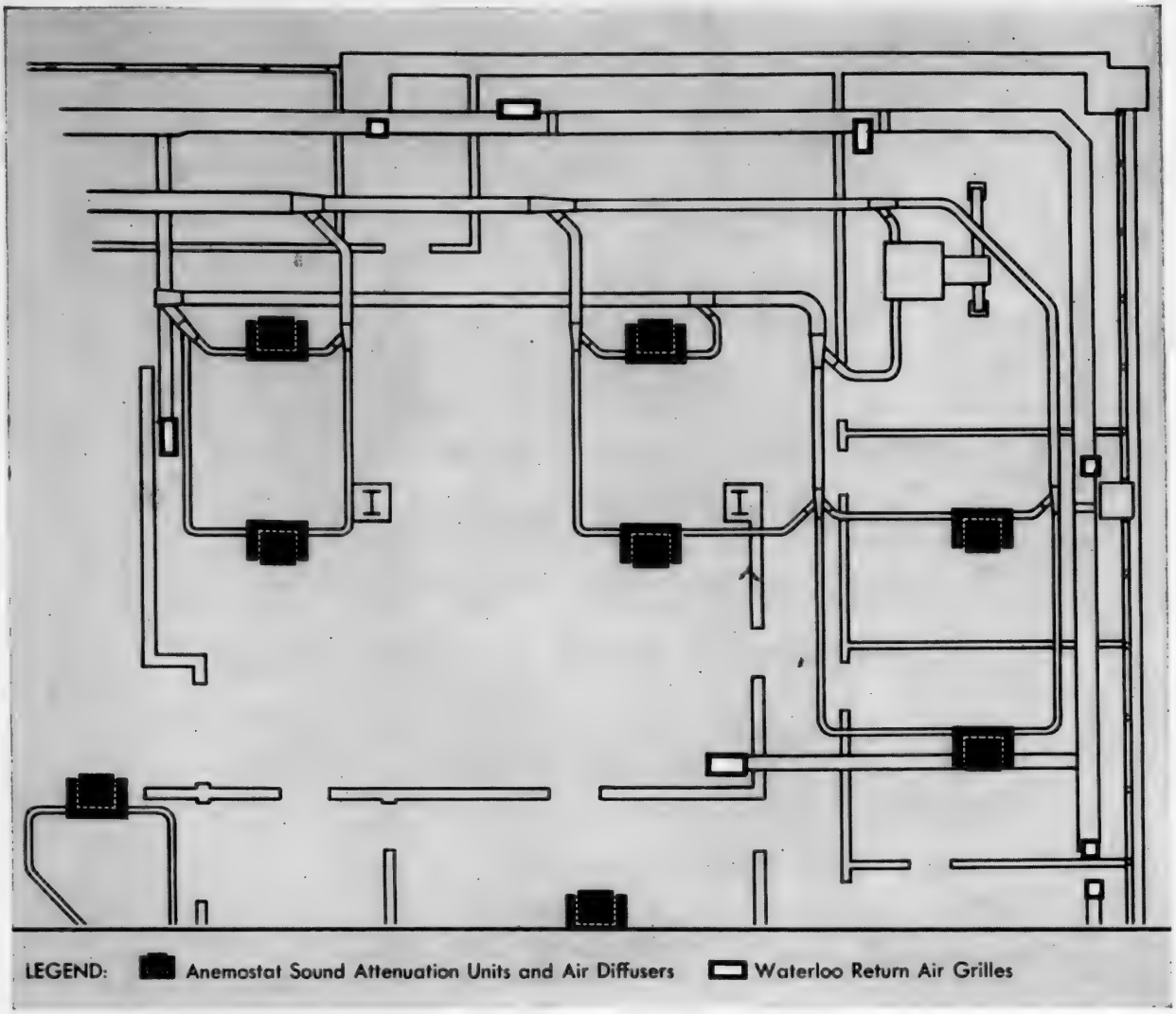

In this typical layout you can see how Anemostat All-Air High Velocity units and Waterloo Return Air Grilles team up to insure quiet, draftless, perfectly balanced air distribution.

The Anemostat All-Air High Velocity distribution system offers many important advantages. It can be used with smaller than conventional ducts; it can be installed in less time and at less cost. It requires no coils; therefore, there is no leakage, clogging or odor. Anemostat round, square and straightline diffusers with high velocity units are adaptable to a wide variety of architectural designs.

Waterloo's complete line of registers and grilles is the result of 57 years of experience.

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REGISTERS • GRILLES • VOLUME CONTROL DAMPERS • DOOR VENTILATORS

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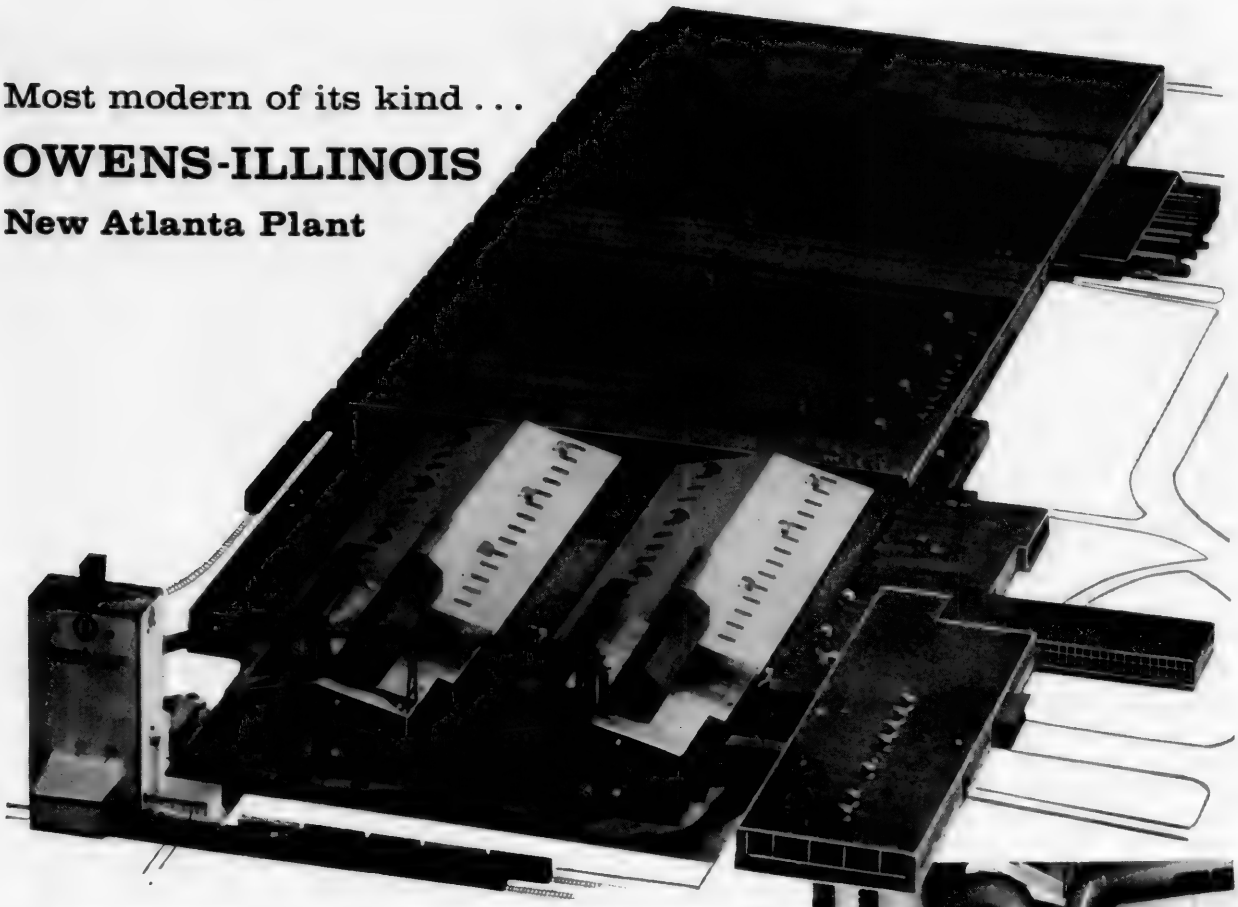


Architects and Engineers: Robert and Company Associates, Atlanta, Ga.

General Contractor: George A. Fuller Company, Altanta, Ga.

Mechanical Contractor: Standard Engineering Company of Washington, D.C.

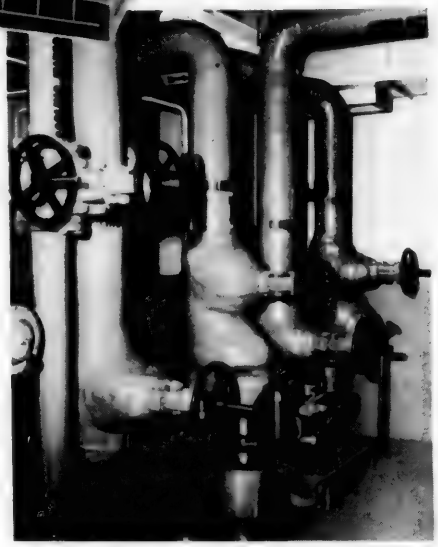
JENKINS VALVES control important service lines

DESIGNED to be the most modern glass container plant in the world, covering 619,000 square feet and highly automated, this new Owens-Illinois plant can produce millions of glass containers annually.

In the glass manufacturing operations trouble-free service piping lines are an essential. Cooling operations require a flow of recirculated water equal to 2-million gallons per day. The furnaces consume about 3-million cubic feet of natural gas per day.

The fact that Jenkins Valves, in large numbers, are used to control water, gas, steam, compressed air and air conditioning lines in this new plant will not surprise most experienced architects, engineers and contractors. For nearly a century, "JENKINS" has been a common specification to assure maximum reliability.

It will pay you to have this important assurance when you specify or install valves . . . especially since Jenkins Valves cost no more. Jenkins Bros., 100 Park Avenue, New York 17.



Some of the many Jenkins Bronze and Iron Valves which control the complex service piping system in the Owens-Illinois plant.

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JENKINS VALVES

LOOK FOR THE JENKINS DIAMOND

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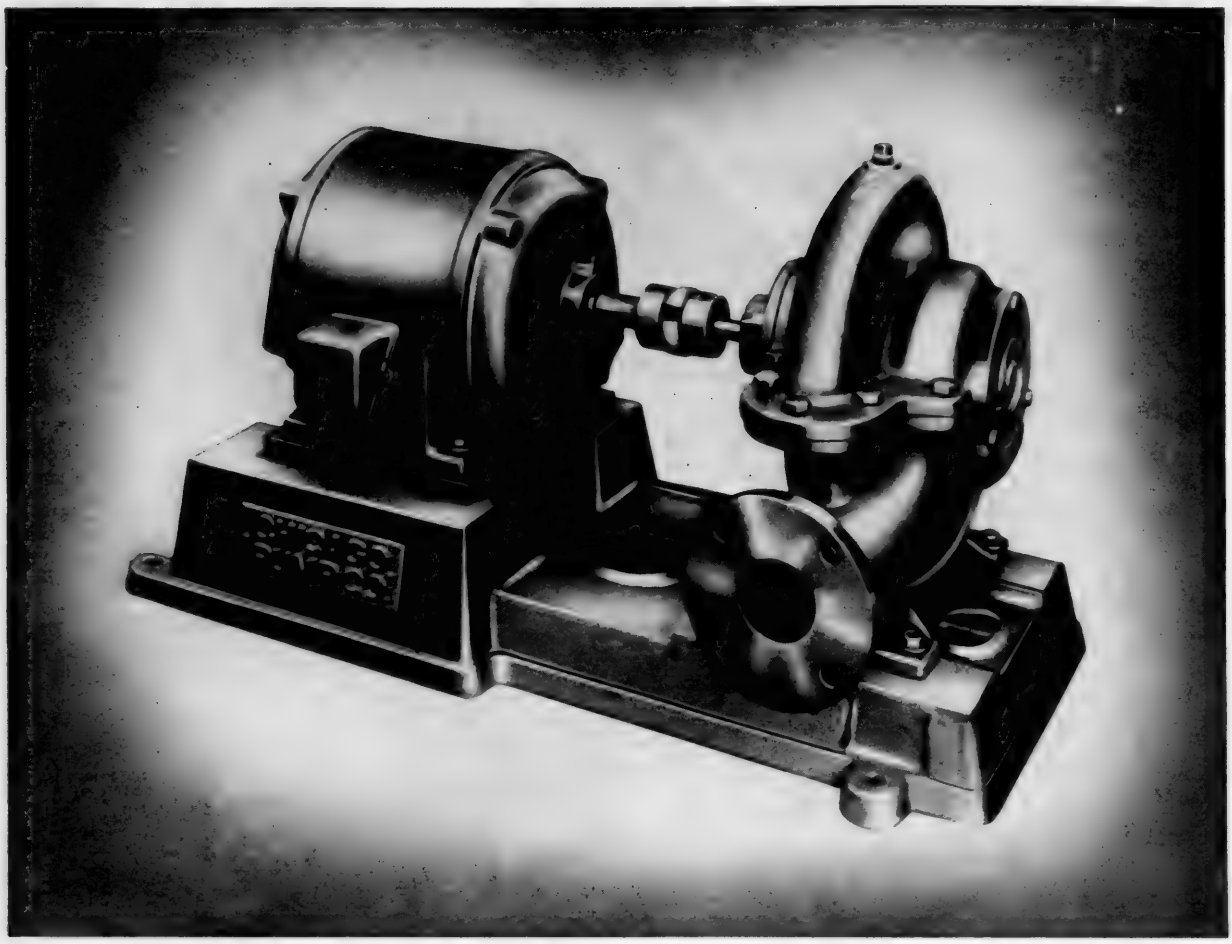

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Quiet Operating . . . Low Cost . . . Efficient, Hydraulically Balanced

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Chicago Pump Company announces a new line of Single Stage, Horizontally Split-Case Centrifugal Pumps—known as Type "S".

These pumps feature heavy shafts . . . short span between bearings . . . minimum space requirements . . . excellent operating efficiencies . . . desirable capacity-head characteristics . . . pre-lubricated ball bearings . . . mechanical seals . . . easily removable rotating assembly . . . suction and discharge on same lower casing centerline . . . rugged construction throughout to insure years of trouble-free service.

Bulletins and engineering data are available to Architects and Engineers from Chicago Pump Company or its Distributors located in most principal cities.

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HUSKY SYSTEMS ARE COMPETITIVE
In nearly every instance Husky welding fitting installations cost the same (or less) than those using threaded fittings because of time saved in joining.

HUSKY IS THE FIRST!
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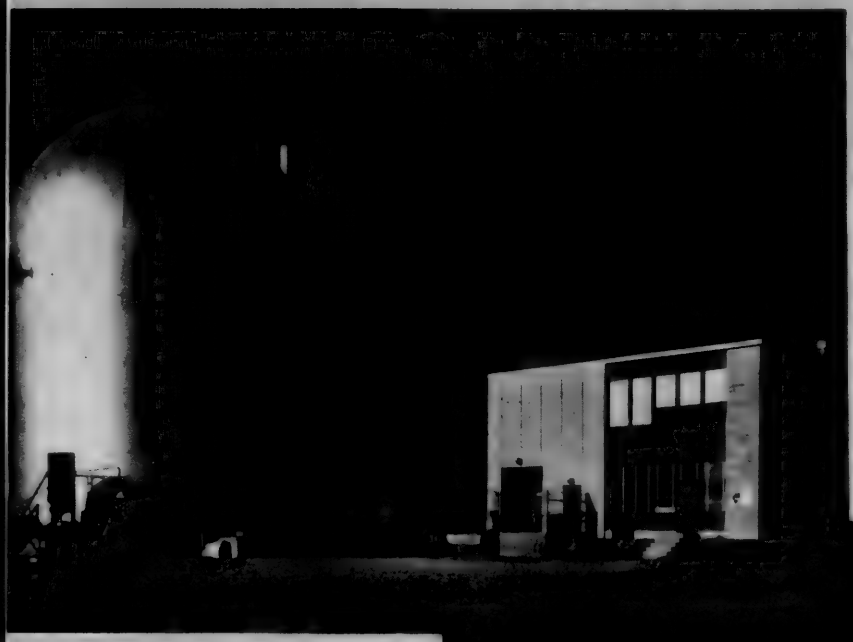

Vallecitos Atomic Power Plant
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The first all privately-financed nuclear power plant.

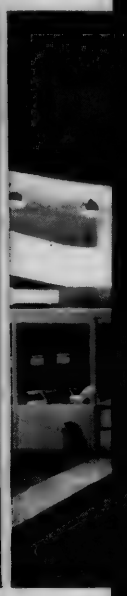
Operated by
Pacific Gas & Electric Co.
and
General Electric Co.
Architects and Engineers:
Bechtel Corp.
all of San Francisco
Mech. Contractor:
Coast Heating and Ventilating Co.
Oakland, Calif.

POWERS CONTROL
here is used in the power plant. It meets the rigid standards required in regulating ventilation supplying personnel with safe, comfortable, uncontaminated air.

Industrial Reactor Laboratories, Inc.
Plainsboro, N. J.

Architects:
Skidmore, Owings & Merrill
Mech. Engineer:
Guy B. Panero
Mech. Contractor:
August Araco, Inc.
General Contractor:
Turner Construction Co.
Prime Contractor **AMF ATOMICS**

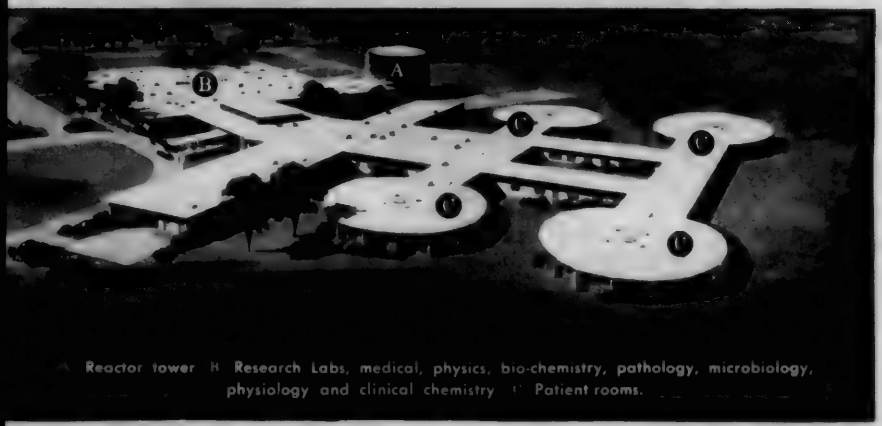
POWERS CONTROL
here regulates the heating, ventilating and air conditioning in the reactor and laboratory buildings.



Medical Research Center, AEC Brookhaven National Laboratory, Upton, N. Y. — Nuclear research here will benefit all mankind. The first nuclear reactor (1000 kw) designed specifically and exclusively for medical research and treatment is located in the reactor tower Ⓐ shown below.

Architects: **Eggers and Higgins** • Mechanical Engineers: **Syska & Hennessy**
Mechanical Contractor: **Malan Construction Corp.** • All in New York City

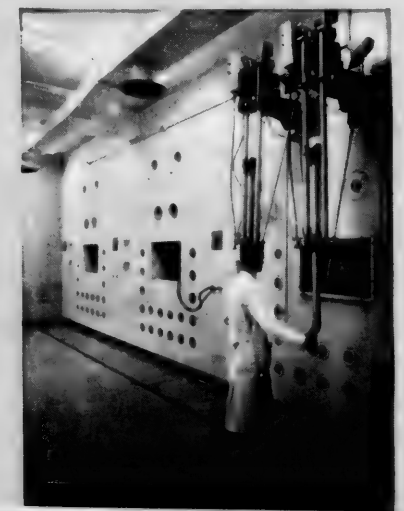
POWERS CONTROL in these completely air conditioned buildings regulates temperature, humidity and ventilation.



A Reactor tower B Research Labs, medical, physics, bio-chemistry, pathology, microbiology, physiology and clinical chemistry C Patient rooms.

Owner-members of Industrial Reactor Laboratories: American Machine & Fdry Co., American Tobacco Co., Atlas Powder Co., Continental Can Co., Corning Glass Works, National Distillers & Chem. Corp., National Lead Co., Radio Corp. of America, Socony Mobil Oil Co., U. S. Rubber Co.

Below: Operators at Industrial Reactor Laboratories, protected by 3 ft. thick viewing windows, conduct experiments with master-slave manipulators shown below.



POWERS CONTROL

...keeps pace with the demands of modern science and industry

At the Birth of the Atomic Age in 1942 at the University of Chicago, temperature of the space occupied by "the first nuclear reactor" was controlled by Powers Type K Thermostats installed under the West Stands of Stagg Field.

In 1944 at Hanford, Wash., Powers Transmitter Controls regulated temperature of the huge volume of water required for cooling the nuclear reactors. The capacities of ten 2500 ton YORK refrigeration compressors, made especially for this important project, were regulated by Powers Series 100 Transmitters and Receiver Controllers. They also controlled 24" butterfly valves used to regulate the distribution of refrigerated air.

Inside the dome at IRL a crane services reactor pool. Powers control here, regulates the ventilation and air conditioning. Note ducts on circular wall.

Accurate Control of Air Conditioning is Vital in modern nuclear reactor plants. Safety and comfort of employees and reliability of ventilation controls are specially important in radioactive "hot" areas. In the three prominent installations on the opposite page, Powers control is required to meet rigid standards of performance.

Other Users of Powers Controls: Some AEC buildings in Oak Ridge, Tenn.; at Argonne National Laboratory, air conditioning and cooling water for a Cyclotron is regulated by Powers; in AEC plants at Portsmouth and Fernald, Ohio and Weldon Spring, Mo.; in Atomic Energy of Canada Ltd., buildings 145 and 465 at Chalk River, Ont., Powers controls heating and air conditioning.

Nuclear Reactor Research Facility of the U. S. Naval Research Laboratory, Wash., D.C. is air conditioned and Powers controlled.

At Illinois Institute of Technology, Chicago, the first nuclear reactor for private industrial research was installed by the Armour Research Foundation. Powers air conditioning control is installed here in the Physics and Electrical Engineering Research building in which the reactor is located.

For Your New Building — Whether its a school, hospital, commercial or industrial building, ask your architect or consulting engineer to include a Powers Quality System of Temperature Control. You will benefit from — **Powers complete responsibility** for a correctly engineered control system, proper installation, continuous successful operation and *SERVICE* when required from offices in 85 cities.

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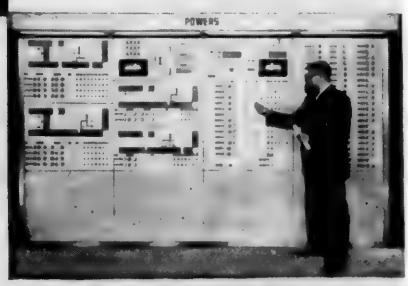
SKOKIE, ILLINOIS | *Offices in chief cities in U.S.A. and Canada*

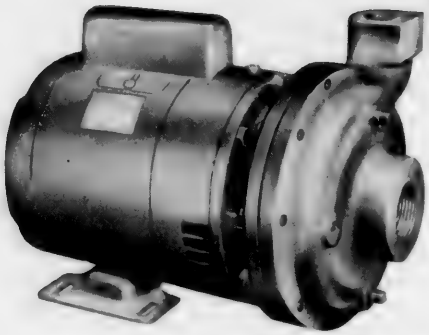
65 Years of Automatic Temperature, Humidity Control

A few Powers Temperature . . Humidity . . and Pressure Controls



Powers Graph-O-Matic Control Centers are also available in Console models. All types are custom built to meet the requirements of any comfort or process control system.

NEW



DUNHAM-BUSH

CENTRIFUGAL PUMPS

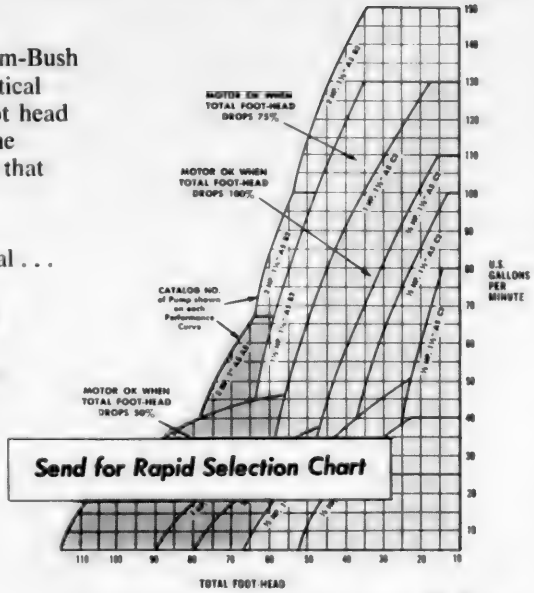
WON'T OVERLOAD

The Rapid Selection Chart shows that the new Dunham-Bush Centrifugal Pumps are non-overloading for all practical purposes. Where others overload when the total foot head drops as little as 5% to 10%, the Dunham-Bush line won't. Motors are sized so that maximum load is under that allowed by motor manufacturers.

Other features include: Impellers Machined All Over . . . Stainless Steel Shaft . . . Top Quality Mechanical Seal . . . 8 Position Rotating Pump Case . . . Rugged and Compact Assembly . . . Available in 13 Sizes . . . Volute Type for Horizontal or Vertical Installations.

The new Dunham-Bush Centrifugal Pumps can be used in hot water systems, chilled water systems, boiler feed, in evaporative condensers and cooling towers. Typical supply system applications include processing, drainage, washer service and booster service.

Send for File No. 1440 listing complete specifications and Rapid Selection Chart.


MOTOR OK WHEN TOTAL FOOT-HEAD DROPS 75%
MOTOR OK WHEN TOTAL FOOT-HEAD DROPS 100%
CATALOG NO. of Pump shown on each Performance Curve
MOTOR OK WHEN TOTAL FOOT-HEAD DROPS 50%
U.S. GALLONS PER MINUTE
TOTAL FOOT-HEAD

Send for Rapid Selection Chart

Dunham-Bush, Inc.

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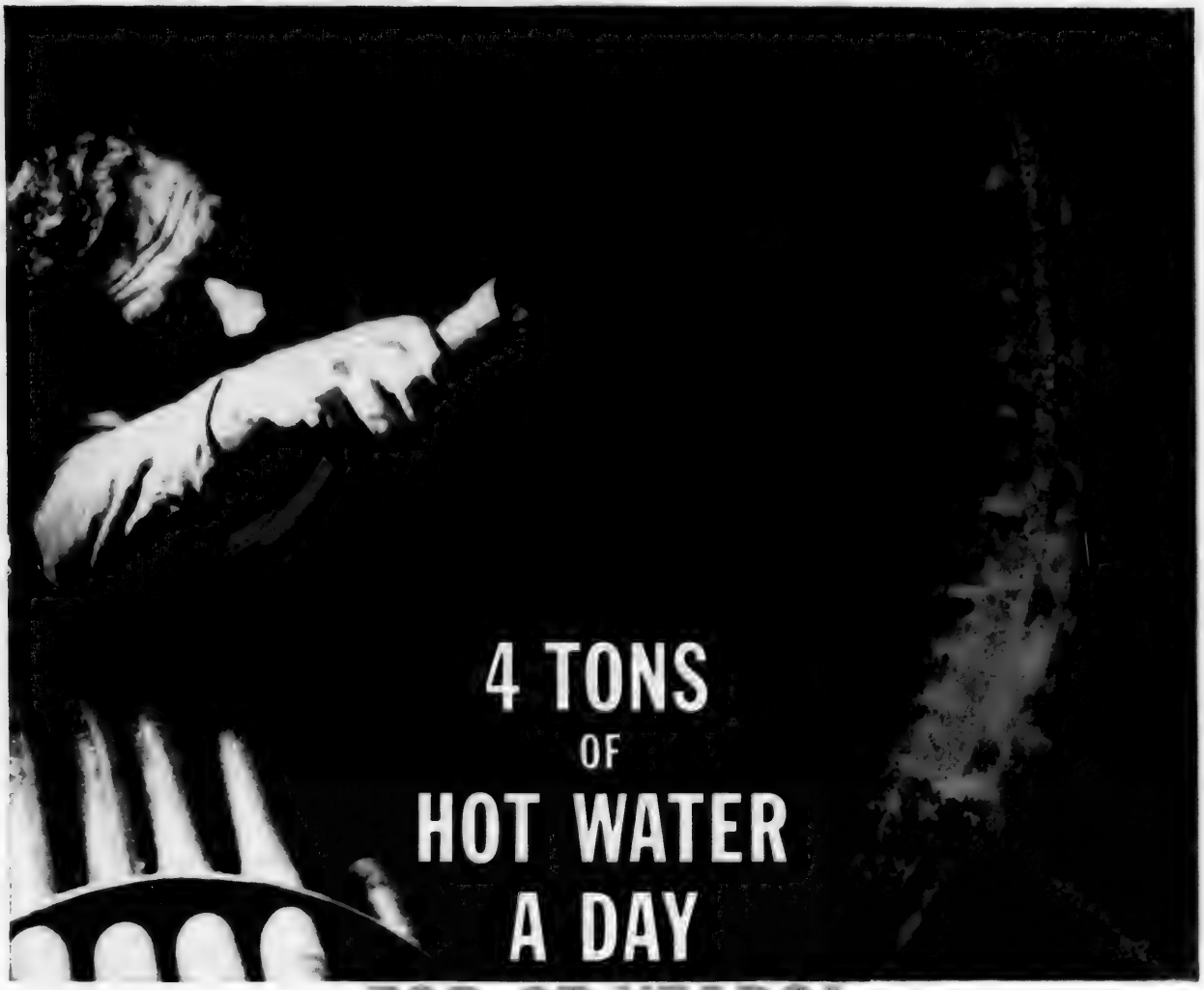
DUNHAM-BUSH

AIR CONDITIONING • REFRIGERATION • HEATING • HEAT TRANSFER

WEST HARTFORD CONNECTICUT • MICHIGAN CITY INDIANA
MARSHALLTOWN IOWA • RIVERSIDE CALIFORNIA

SUBSIDIARIES

R. B. Scally, stationary engineer at the Bronx (N. Y.) County Building, checks the interior of the P-K copper-lined storage water heater which has been in continuous use for 27 years. Annual inspections always show the unit to be in first-class condition.



FOR 27 YEARS!

...that's the no-trouble service record of this P-K copper-lined storage water heater

Back in 1932 this P-K copper-lined storage heater was installed in the Bronx County Building, in New York. Since that time, it has processed 8½ million gallons of rust-free hot water at 140° F. The unit is inspected annually; "And," says John Bennett, the building's senior stationary engineer, "we always find it in excellent condition."

Why users expect—and get—maintenance-free operation from P-K's Copper-Lined Heaters

Steel shells of P-K copper-lined storage water heaters are double butt welded. All inside welds are ground flush, and the stored hot water contacts only copper or copper-silicon. Expansion joints in the lining, placed every 12", allow longitudinal expansion. All couplings and fittings are of copper-silicon. Couplings are heavy, reinforced forgings welded to both sides of the lining. Wherever they are used, P-K storage heaters are running up impressive performance records. *Patterson-Kelley Co., 1103 Warren Street, East Stroudsburg, Pa.*

4

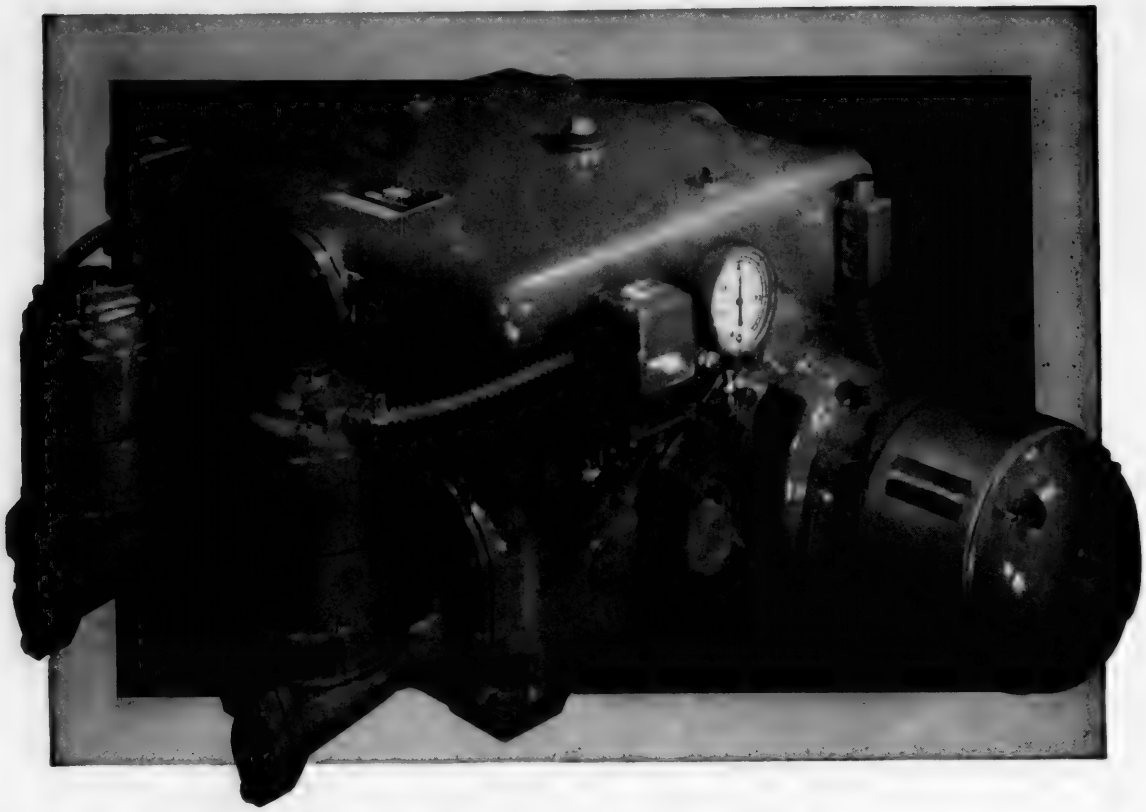
Send for your copy of this latest P-K Data File No. 16 on Copper-Lined Storage Water Heaters

Patterson Kelley
Water Heater Division

storage water heaters • instantaneous heaters • convertors • water to water exchangers

THIS NEW VACUUM HEATING PUMP

HAS THE INCREASED AIR CAPACITY EFFICIENT HEATING PRACTICE DEMANDS



It's the Nash CSM

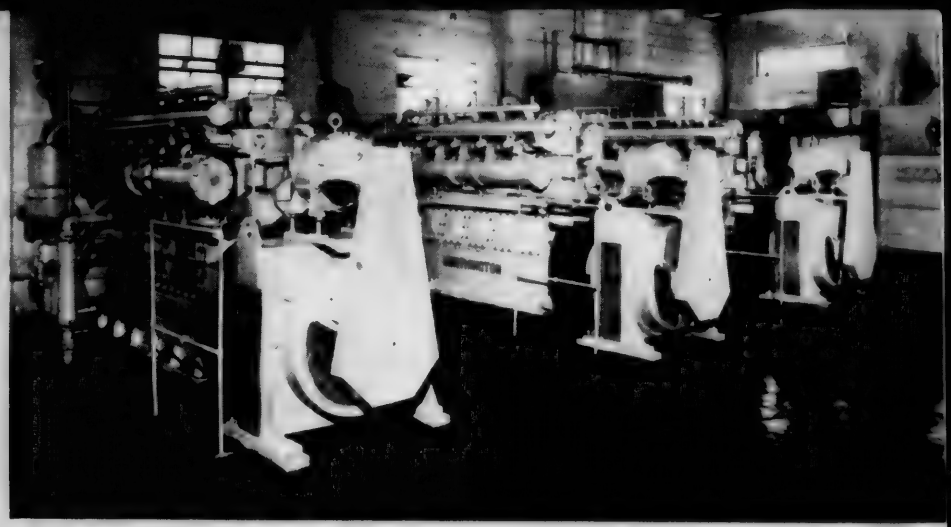
Designed and manufactured by the organization that made the Jennings Manifold Heating Pump standard of the Heating Industry, the new CSM incorporates every desirable feature architects, engineers, owners and operators have sought. Employing separate air and water pump elements, each with its own motor and each independently controlled by its own automatic switch, the capacities and arrangement may be widely varied to meet job conditions. For the first time, the engineer has the choice of realistic water and air capacities required for rapid system response without wasteful overheating.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
- Control system that operates individual pumps only when needed.
- Flexibility permitting addition of radiation without changing basic pump installation.
- Low, low, return line connection.

NASH ENGINEERING COMPANY

437 WILSON, SO. NORWALK, CONN.



Heat recovered from diesel engines can be economically used for space heating.

Heat Recovery from Diesel Engines

W. E. BELL
Application Engineer, Worthington Corp., Harrison, N. J.

How to obtain a heat balance for an oil operated diesel engine. From this one can determine the amount of heat that will be available for the operation of space heaters. Illustrative problems are included.

FOR more than half a century, the heavy duty diesel engine has been operating in power plants throughout the world. As the diesel engine is used so widely, it has to operate on several different fuels, depending on the availability of fuel where the unit is operating. Hence, diesel engines are operating in power plants on fuel oils from the very low viscosity up to and including the bunker oils. These engines are also adapted to operate on a mixture of natural gas and oil, manufactured gas and oil, and on straight gas.

In sewage plants diesel engines operate on mixtures of sewage gas and oil and on straight sewage gas with a Btu content as low as 500 Btu per cu ft.

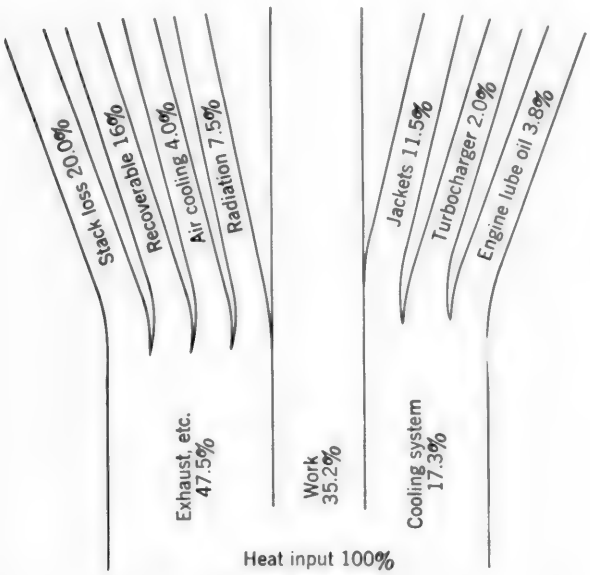


Fig. 1. Heat distribution chart.

Thermal Efficiency is High

This engine, whether operating as a straight oil engine, or on a mixture of gas and oil, or as a straight gas engine, has the highest thermal efficiency of any prime mover on today's market for ratings up to 3000 bhp.

The diesel engine fuel consumption (Btu per bhp-hr.) is much lower than the fuel consumptions of other prime movers such as gas turbines, steam turbines, and gasoline engines. In addition to improved fuel economy, such other factors as dependability and low maintenance are the reasons why the diesel engine is found in many and varied applications driving generators, pumps, blowers, compressors, drag lines, locomotives, trucks and ships.

With the increasing cost of fuels it becomes more and more important to improve the overall plant thermal efficiency. This can be done in a diesel plant by utilizing the waste heat as a source of extra power, as well as a source of heat for either industrial processing, or plant heat applications.

Exhaust Heat Utilized

As a source of extra power, the exhaust gas is partially utilized to drive an exhaust gas turbine. Directly coupled to this turbine is a centrifugal air blower which supplies the greater quantities of air needed for combustion in today's high output engines. Further heat can still be ex-

W. E. Bell received a B.Sc. in Electrical Engineering in 1951 from the University of New Brunswick. He was a pilot in the Royal Canadian Air Force, and since leaving the air force in 1954, he has been with the Worthington Corporation serving as a diesel engine sales and application engineer.

tracted from the jacket water and the exhaust gas, as is done in a Los Angeles sewage plant.

In this Los Angeles Hyperion Plant, the engine cooling water circulates through the engine, absorbing the heat rejected to the engine jackets. This cooling water then passes through an exhaust gas heat exchanger which absorbs 50% of the heat in the exhaust gas. From the exhaust gas heat exchanger, this water goes to a cyclonic separator where it is flashed to steam at 10 psig. This steam is then used for plant and sewage digester heating.

Many heat balance applications have been developed to the condition where 80% or more of the heat in the fuel has been put to useful work.

The main purpose of this article is to show how typical heat balance charts on diesel engines are made, and how these charts can be applied to the sizing of space heaters.

A typical heat distribution chart is shown in Fig. 1. This chart shows the percentage of input heat that is utilized by work, stack loss, and cooling mediums on a diesel engine. It is based on a fuel consumption of 0.375 lb per bhp-hr.

In order to obtain the percentages shown on this chart. an engine heat balance must be obtained. One method of obtaining a heat balance is as follows:

A production diesel engine is started and allowed to warm up for two hours. A third hour is allowed to stabilize the engine at full load to assure accurate steady flow temperatures.

When temperatures are stable, the fuel oil flow rate is measured with a platform scale. The amount of fuel weighed in any one fuel run is between 25 to 50 lb, depending on the brake horsepower rating of the engine.

Problems

Example: 50 lb. of fuel is measured in 5.38 minutes with the engine developing 1500 bhp at rated rpm.

$$\text{Fuel consumption} = \frac{50 \text{ lb} \times 60 \text{ min/hr.}}{5.38 \text{ min} \times 1500 \text{ bhp}} = .372 \text{ lbs per bhp-hr}$$

High heat value of fuel oil used = 19,350 Btu per lb

Total heat input 0.372 lb per bhp-hr × 19350 Btu per lb = 7198.2 Btu per bhp-hr

Heat equivalent of 1 bhp-hr = 2545 Btu per bhp-hr

$$\text{Thermal efficiency} = \frac{2545}{7198.2} = 35.4\%$$

The heat absorbed by the different engine cooling mediums can be obtained with the cooling water circuits arranged as shown on Fig. 2.

The flow rate is measured with a platform scale and a stop-watch. An elevated storage tank supplies the required cooling water and prevents pressure changes that would occur if city water were used directly.

With the temperature differentials through the engine and associated coolers held constant, one flow rate is measured with the barrel and scale, the remaining streams of water being diverted to the drain.

Example: The jacket water is allowed to flow into the barrel. All the remaining cooling water is diverted to the drain.

Scale and temperature readings are taken with the engine at rated bhp and rpm.

Weight of jacket water per minute = 171.5 lbs

Temperature of water in storage tank = 38 deg F

Temperature of water from engine to barrel = 159.3 F

Load on engine = 1500 bhp

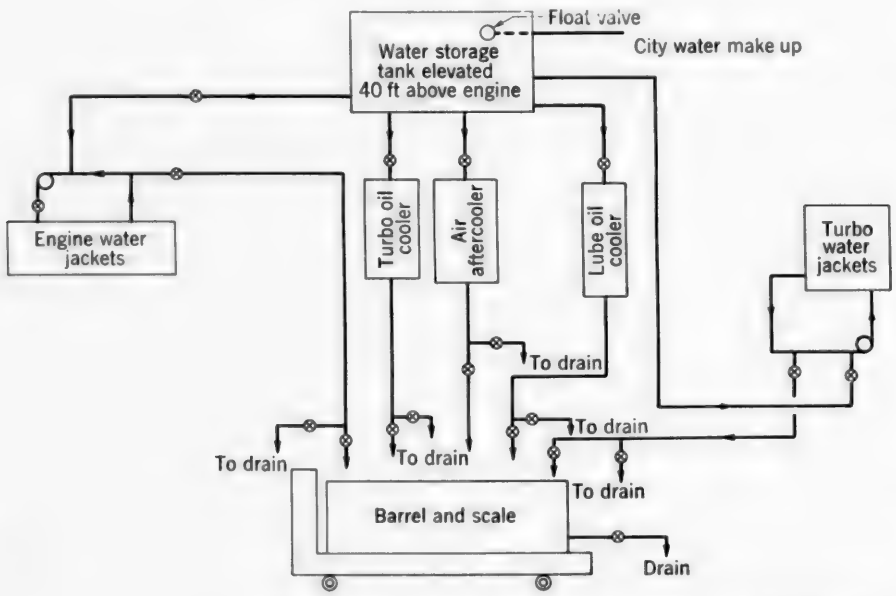


Fig. 2. Cooling water circuits to show where heat is absorbed.

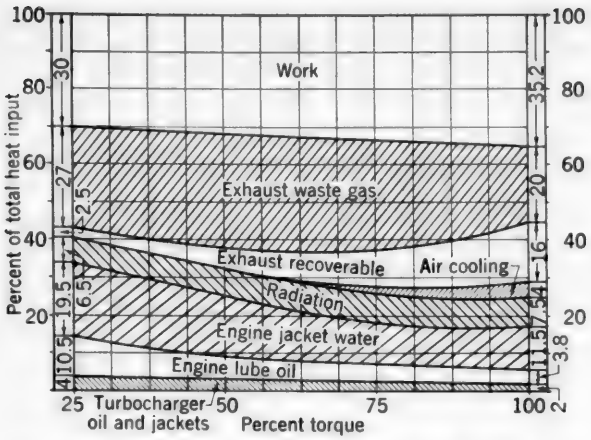


Fig. 3. Heat distribution chart for a variable torque constant speed application.

$$\text{Jacket water Btu per bhp-hr} = 171.5 \text{ lb per min.} \times (159.3 - 38) \text{ deg F} \times \frac{60 \text{ min/hr}}{1500 \text{ bhp}}$$

$$= 835 \text{ Btu per bhp-hr}$$

The same method as listed above is used to determine the Btu per bhp-hr for:

The turbocharger jacket water
The turbocharger lube oil
The air aftercooler
The engine lube oil

Heat Dissipated

Having determined the heat utilized for work as well as the heat absorbed by the different cooling mediums, we can now determine the heat dissipated by the exhaust gas per bhp-hr.

This is done by multiplying the weight of the exhaust gas per bhp-hr by the specific heat of the exhaust gas and the temperature differential between the ambient and the temperature of the exhaust gas.

The weight of the exhaust gas is determined by adding the weight of the fuel bhp-hr to the weight of the cfm per bhp-hr of air through the engine.

The cfm of air through the engine is measured with a flow nozzle and application of the following formula.

$$Q = C_q \sqrt{\frac{T \Delta H}{P}}$$

Where

Q = Inlet volume flow cfm
C_q = Nozzle flow coefficient
T = Air inlet temperature, deg Rankine (0 deg F + 460)
ΔH = Pressure drop across flow nozzle inches of water
P = Barometric reading inches of Hg

Example: With an engine operating at 1500 bhp at rated rpm and the flow nozzle coefficient equal to 517.5, the following readings were taken:

Ambient temperature	= 83 deg F
After turbo exhaust gas temperature	= 795 deg F
Barometric pressure	= 29.38 inches of Hg
To	= 543 deg R
ΔH	= 4.23 inches of water
Q	$= 517.5 \sqrt{\frac{543 \times 4.23}{29.38}}$
	= 4570 cfm
cfm per bhp $= \frac{4570}{1500}$	= 3.05
Weight of air = .075 × 3.05 × 60	= 13.725 lb per bhp-hr
Weight of fuel	= 0.372 lb per bhp-hr
Weight of exhaust gas	= 13.725 + 0.372
	= 14.097 lb. per bhp-hr
ΔT = exhaust temperature after turbo − ambient temperature	
	= 795 — 83
	= 712 deg F
Specific heat of exhaust gas	= 0.246
Exhaust gas Btu per bhp-hr	= 14.097 × 0.246 × 712
	= 2469 Btu per bhp-hr

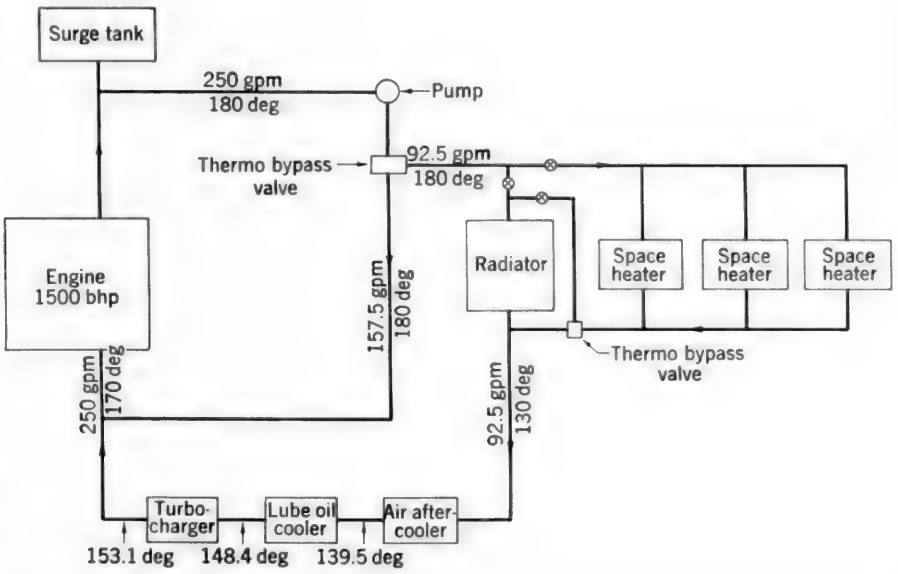


Fig. 4. Heat recovery application with circuit direct to space heaters.

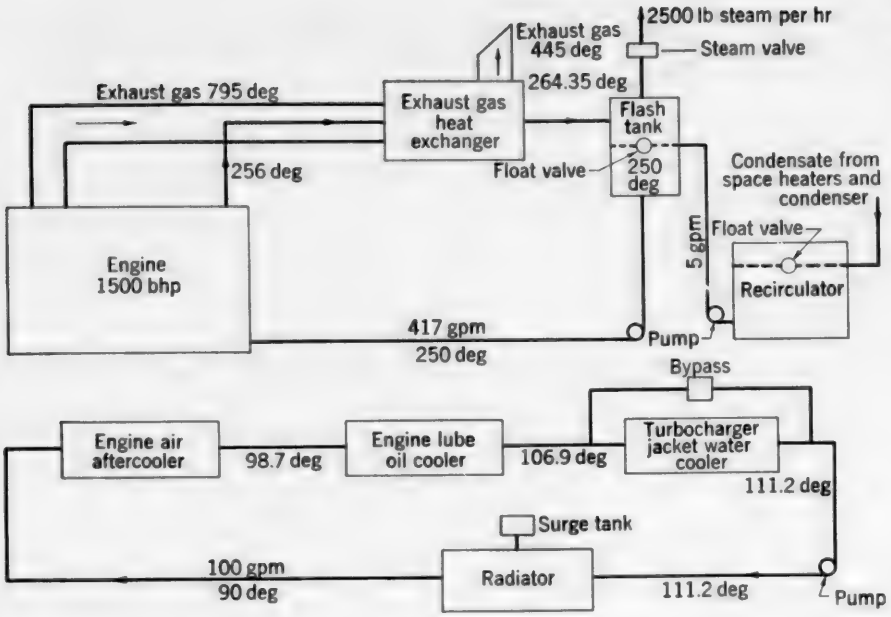


Fig. 5. Heat recovery circuit in which an exhaust gas heat exchanger is used.

The foregoing illustrates a heat balance for a constant speed, constant torque condition.

To obtain a heat balance at variable torques, the same procedure used in the foregoing is repeated at different loads.

The fuel consumption increases as load is decreased, causing a higher Btu per bhp-hr to be absorbed by the exhaust gas and other cooling mediums of the engine.

For this reason, curves shown in Fig. 1 do not apply at partial load.

A typical heat distribution chart for constant speed, variable torque is shown in Fig. 3. More heat can be recovered from the exhaust gas than shown; however, the values shown in this figure were determined on the basis of the lowest possible expenditure for heat recovery equipment.

With the information we have obtained from our heat balance, typical results which are shown in Figs. 1 and 3, it is now possible to determine the amount of heat available for space heaters.

Depending on the amount of heat required for space heaters, we can arrange the equipment in such a way as to recover the heat from the engine jackets only. This type of heat recovery can usually be utilized without expensive equipment, because hot water or steam can be circulated directly to space heaters without an intermediate heat exchanger. A typical diagram of this arrangement is shown in Fig. 4. If more heat can be utilized, we can have the jacket water, on leaving the engine, pass through an exhaust gas heat exchanger, thereby removing part of the exhaust waste heat. A typical diagram of this type of system is shown in Fig. 5.

Knowing the fuel consumption for a certain engine, we can readily determine the total input heat. Referring to Fig. 4 where the heat from the packet water only is required, one can see from Fig. 3 that 11.5% of the input heat can be recovered for space heaters at full load and 19.5% at 25% load.

If, on the other hand, this jacket water is passed through an exhaust gas boiler as shown in Fig. 5, we can recover (referring to Fig. 3, exhaust recoverable plus engine jacket water) 27.5% of the input heat for space heaters at full load and 22% of the input heat at 25% load.

These figures are on the conservative side and are based on the smallest possible dollar outlay for heat recovery equipment.

The cost of the additional equipment to recover the heat from the exhaust and jacket water to obtain results as shown in Fig. 3 would be less than 5% of the cost of the engine and generator equipment for a 1000 kw unit. Hence, we can readily see the savings involved by utilizing the waste heat.

In modern diesel engines, where the engine jacket water flows through an integrated water jacketed liner, steam can be produced up to 35 psig for utilization in space heaters.

Figure 5 shows such a system producing steam at 15 psig. Referring to Fig. 5, when the engine is started, the jacket water pump circulates the water through the engine, the exhaust gas heat exchanger, and the flash tank. Except for radiation, no cooling takes place. The water, therefore, boils. As this water boils, the engine heat absorbed by the 471 gpm of circulating water, flashes 5 gpm of its flow to steam inside the flash tank.

The steam is then fed to the space heaters, the excess going to a condenser. The condensate is then returned to a recirculator and from there, back to the engine jacket water circuit as required.

Systems as mentioned are not new. As far back as 1939, Namm's Department Store, Brooklyn, N. Y., generated its own diesel power and recovered the heat from the engine jacket water and exhaust to heat the building.

Many other such applications can be listed where diesel engines, in addition to producing low cost power, are saving dollars in plant heating.

Although this article has dealt specifically with heat recovery on oil diesel engines, higher plant thermal efficiencies can be obtained from high compression diesel engines adapted to operate on a mixture of natural gas and oil, manufactured gas and oil, or straight gas.

Pollen Removal by Air Filters

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This article describes the performance of glass and metal fiber filters in removing ragweed pollen from the air. Efficiency and resistance characteristics are presented for various filter thicknesses, fiber packing densities, fiber diameters, and degrees of oiling of several commercial filter designs. With good mineral fiber dispersion and lubrication, ½, 1, and 2-inch thick filters showed average count efficiencies of 50, 70, and 92%, respectively. The efficiency of metal screen viscous filters exceeded 96%.

POLLEN removal from supply systems ordinarily is not considered extensively in the air cleaning literature since the removal involves collection of particles greater than 20 microns in diameter. Electrostatic precipitators, high efficiency felted or woven fabric filters, and a variety of preformed mineral or synthetic fiber beds (1-5 micron diameter fibers) provide nearly 100% removal of pollen grains or any other dusts of equivalent size. However, typical roughing or impingement type filters, i.e. coarse glass or metal fibers which are usually adhesive coated (designed for the pre-cleaning of outside air for either general home or special process ventilation). may not always be 100% effective in pollen collection.

Where the filter resistance is limited by the available fan capacity, it may be necessary to reduce the thickness or the packing density of the fiber in order to handle the required air volumes. Screen type glass fiber filters, ½ inch thick, used in conjunction with small home-type air conditioning units illustrate this design.

The type and manner of application of adhesive coatings used by many manufacturers to improve efficiency and holding capacity may have a significant effect on the performance of roughing filters. Previous tests by this laboratory have shown that stain efficiencies with a fly ash aerosol (mass medium diameter 12 microns) increased from 3 to 60 % when the proper adhesive was applied to a commercial wire screen type filter[1]. It was also demonstrated that the performance of spray coated filters was often poorer than that for oil dipped ones. Lack of uniformity in fiber packing density and poor edge sealing also accounted for considerable variation in efficiency for a single filter design. Although low voltage electrostatic precipitation will provide complete pollen collection at low resistance (< 0.1 inch water) for practical purposes[2], the cost of such apparatus may not be justified in terms of the degree of cleaning that is sought.

A review of the literature indicates that very little information is available on methods of rating air cleaning equipment, particularly ventilation type filters, for pollen removal. An early article by Drinker and Wells[3] from this laboratory, and a subsequent paper by Hughes[4] describes testing procedures that have been used.

Hughes reports performance of a 20 x 20 2-inch glass fiber filter at a face velocity of 400 fpm using extremely high pollen concentrations in his test suspension. Samples collected in this study were obtained by allowing pollen grains to settle on glass slides. Since dispersion of pollen grains as discrete particles is difficult to attain at high loadings and the sampling technique used did not guarantee representative values, the reported efficiencies, approximately 97%, may be in error.

The main objectives of this study were (1) to determine the efficiency and resistance characteristics of several common types of roughing type filters used in air conditioning systems and (2) to develop methods of aerosol generation and sampling which would be suitable for dispersing and measuring air-borne pollen concentrations in test apparatus.

In this report, efficiency and resistance data are presented for mineral fiber and wire screen type viscous filters at rated air flow. All filters were either selected at random from the daily production of the manufacturer or purchased from local suppliers. Major variables

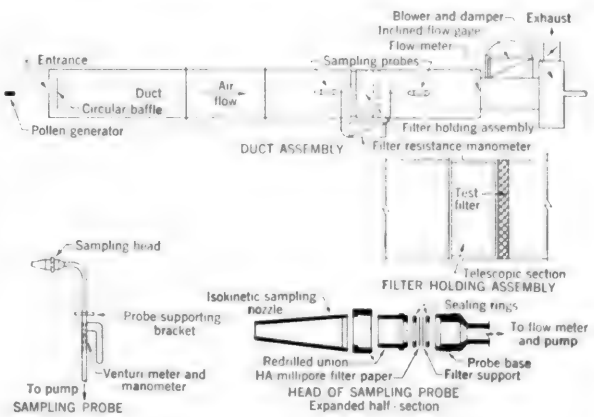

Fig. 1. Apparatus for pollen efficiency tests.

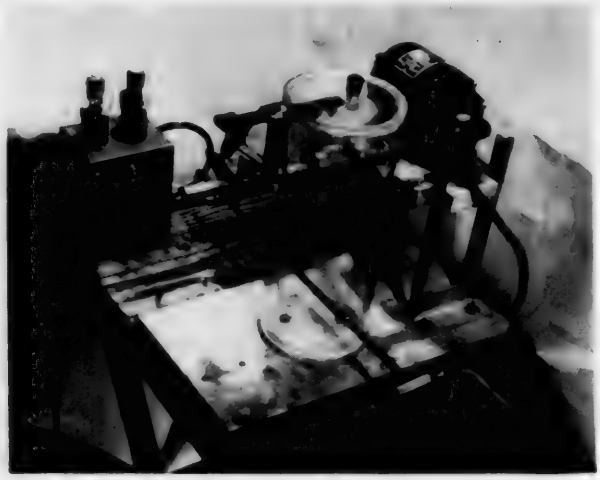

Fig. 2. Pollen generator used in the tests described.

include the type and diameter of fiber, fiber packing density, and thickness of filter. Giant ragweed pollen (ambrosia trifida), about 20 microns in diameter, was used for all tests since it is a common allergen and one of the smallest pollen sizes. Results of studies on a low voltage, two-stage electrostatic precipitator and two types of electrified fiber media are also presented for comparison.

Test Apparatus

Duct Work and Filter Holders. Figure 1 shows the apparatus employed in the testing of commercial type filters which was modeled after equipment developed by the National Bureau of Standards. Test aerosols were introduced at the inlet of a rectangular duct section (20 x 20-inch cross section) and deflected symmetrically by a 12-inch diameter mixing baffle located 3 inches beyond the inlet. Test filters were placed in a special frame section approximately 12 ft downstream from the entrance. Air samples were withdrawn immediately before and after the test filter by means of special sampling nozzles located on the duct centerline. According to velocity and loading traverses made at the upstream sampling position, the 12 ft entry section provided adequate mixing for centerline sampling. Total air flow through the filter was measured by an orifice meter located approximately 4 ft downstream from the filter and immediately before the fan. Static pressure taps on either side of the filter were provided to measure its resistance. System air flow was either 800 or 1,200 cfm depending upon operating specifications. Filters were sealed into position so that the only possible air leakage would be that due to frame construction.

Sampling Probes. The sampling probes used in this study are shown in Fig. 1. Details on probe design have been reported previously[1]. Membrane (AA Millipore) filters were placed in the nozzle section of the probe and were supported by the blotting pad customarily supplied with them. A tapered plastic tip was attached to the end of the nozzle so that samples could be removed from the air stream isokinetically. Location of the sampling media within the nozzle eliminated the problem of particle loss by deposition within a lengthy probe. AA Millipore filters were selected since their resistance was much lower than that obtainable with the HA type. Since pollen grains were almost 30 times greater than the AA filter pore diameter (0.7 micron) no sampling accuracy was sacrificed. Simultaneous up- and downstream samples were collected at flow rates of 0.6 to 0.9 cfm for periods ranging from 10 to 30 minutes. At 800 and 1200 cfm operation, average duct (and sampling) velocities were 286 and 432 fpm, respectively Leiman vacuum pumps were employed for sampling purposes.

Pollen Generation Apparatus. A pure grade of ragweed pollen purchased from an allergen supply house (and attenuated by some 25 years of storage) was placed in the generator shown in Figs. 2 and 3. According to

TABLE I—RAGWEED POLLEN FILTRATION

Rigid Glass Fiber (173 Micron Diameter)—Manufacturer A

Filter* Thickness (Nominal) and Number	Resistance Inches of Water	Inlet Pollen Concentration Grains per Cubic Yard	Count Efficiency, Per Cent	Penetration Per Cent
½ Inch	Measured thickness = 0.72 inch, fiber packing density = 1.42 lb per cu ft			
1	0.036	790	51.4	48.6
2	0.042	1670	57.0	43.0
3	0.035	556	38.0	62.0
4	0.035	2280	52.8	47.2
1 Inch	Measured thickness = 0.98 inch, fiber packing density = 2.1 lb per cu ft			
5	0.082	2430	70.6	29.4
6	0.075	1020	70.9	29.1
7	0.069	1140	67.0	33.0
8	0.075	1330	67.5	32.5
2 Inch	Measured thickness = 1.82 inch, fiber packing density = 2.3 lb per cu ft			
9	0.124	1840	90.5	9.5
10	0.134	1170	94.0	6.0
11	0.125	281	71.0	29.0
12	0.131	1770	88.4	11.6
13	0.165	234	94.2	5.8

* Filter capacity = 800 cfm, 20-inch × 20-inch frame.

microscopic size analysis, its mean size by count, Mg, was 19.6 microns and its geometric standard deviation, sg, was 1.08 (98% of the grains ranged from 17 to 23 microns in diameter). Thus, this problem was about as close to a homogeneous particulate as one could expect to find. The generator was developed especially for this study to provide very low and reasonably constant pollen concentrations which would stimulate its natural outdoor occurrence. According to Stern[5], typical outdoor pollen concentrations range from 0 to 200 individual pollen grains per cubic yard, although higher levels may be encountered. The term grain as used in this paper refers to individual pollen particles and not to a weight unit.

Use of Pollen Generator for Tests

Low concentrations were desirable during these tests to reduce the probability of agglomeration effects in generation equipment. However, the actual test levels used were about ten times greater than normal values so that sufficient pollen grains could be collected for a reliable count. In addition, comparatively short sampling periods (< 30 minutes) were chosen to prevent any significant pollen deposit upon the filter surface during any test.

In using the pollen generator, a small amount (1 to 3 grams) of pollen was placed in the revolving cylindrical screen by pouring it into the pollen generator feed tube. Inward air flow through this tube assisted in pollen dispersion. The cylindrical screen was rotated by a thyraton controlled motor at a rate of 30 to 50 rpm. Rotation caused the crank to lift the spring-loaded rapping mechanism of the generator and the return spring caused a rapping of the tube connected to the screen. The combination of rotation, inward air flow, and rapping plus the rolling beads on the fine mesh screen (200 mesh) released a fairly steady, well dispersed light stream of pollen within the large lucite cylinder. A perforated samping thief tube connected to the aspirator unit withdrew only a small aliquot of the pollen settling in the lucite cylinder. The pollen grains entering the tube were

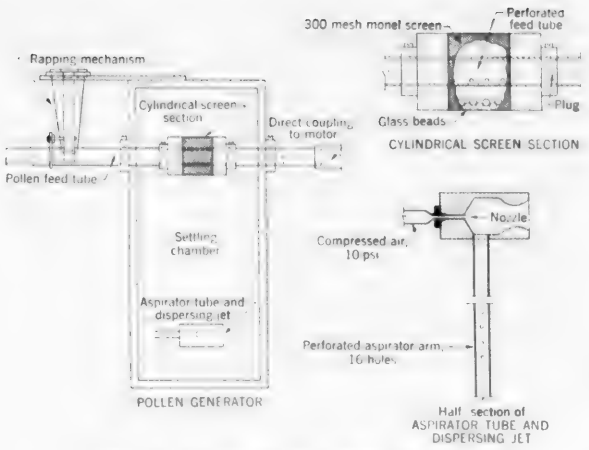

Fig. 3. Details of the pollen generator.

dispersed with the ejected air directly to the inlet of the filter test unit, Fig. 1. Cleaned, dried air was used in the ejector. Concentrations were regulated by varying either the screen rotation rate or the pressure and volume of ejector air supply. The ejector nozzle was adjustable to vary the rate of aspiration through the sample tube. Total ejected air volume was approximately 0.8 cfm.

The generator has proved very satisfactory and there has been very little evidence of any agglomerates on the filter samples collected. The method of assessing the performance of a given filter was to draw a known and constant flow of air through each sampler while the pollen generator was running. The pollen was dispersed into the duct as indicated in Fig. 1. The baffle shown aided in providing uniform cross-sectional loadings. Before actual filter tests, several simultaneous samples were taken at sampling points without a filter in the test section so that the pollen distribution and reproducibility of the sampling technique could be established. This same procedure was used in all of our filter testing, (as well as at the Bureau of Standards) to verify the sam-

TABLE 2—RAGWEED POLLEN FILTRATION

Flexible Glass Fiber (35 Micron Diameter)—Manufacturer A

Filter* Thickness (Nominal) and Number	Resistance, Inches of Water	Inlet Pollen Concentration Grains per Cubic Yard	Count Efficiency, Per Cent	Penetration, Per Cent
½ Inch	Measured thickness = 0.71 inch, packing density = 0.34 lbs per cu ft			
14	0.040	5420	45.0	55.0
15	0.040	5650	67.0	33.0
16	0.036	2050	65.3	34.7
17	0.036	1550	62.5	37.5
1 Inch	Measured thickness = 1.01 inch, packing density = 0.35 lb per cu ft			
18	0.065	4250	89.5	10.5
19	0.064	3700	72.0	28.0
20	0.065	6150	75.8	24.2
21	0.064	1300	76.7	23.3
2 Inch	Measured thickness = 1.96 inch, packing density = 0.34 lb per cu ft			
22	0.081	9150	91.2	8.8
23	0.077	27000	89.9	10.1
24	0.078	1680	91.0	9.0
25	0.073	1940	92.0	8.0

* Filter capacity = 800 cfm, 20-inch × 20-inch frame.

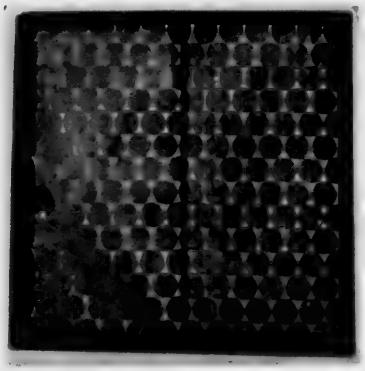

Fig. 4. Typical glass fiber filter.

pling procedure. Without a filter it was found that checks could be made on up- and downstream loadings between the two locations well within 2%.

Determination of Pollen Concentration

The pollen grains on the sample collection filter were counted by inverting the filter and making it transparent with immersion oil on a glass slide without a cover slip according to the procedure described by First and Silverman[6]. A count of all the particles on a statistically evaluated portion (¼ to ½) of the filter was then made under a calibrated microscope with low dry magnification (10X objective and 25X eyepiece: magnification 250X). In the case of the upstream sample it was not necessary to make a complete count of the filter after verifying statistical sampling of a given filter cross-section aliquot. On the downstream filters, except in a few cases where loadings were high, it was necessary to make a complete traverse of the whole field represented by the sampling filter area.

Test Results for One Filter Group

Table 1 summarizes average performance data for a series of tests on thirteen glass fiber filters supplied by Manufacturer *A*. This type is shown in Fig. 4. Filter media consisted of rigid, coarse (173 micron diameter) resin-bonded glass fibers packed in cardboard frames (19⅞ x 19⅞-inch cross section) and ranging from a nominal ½ to 2 inch in thickness. Fibers were oriented in jackstraw fashion and were coated with a thin layer of adhesive (approximately equivalent to SAE 30 oil in viscosity). Metal supporting screens (residual metal stock after punchings are removed for metal can ends) held the fiber in place.

Although filter frame dimensions corresponded to the designated thickness ratings, several measurements on each filter size showed that the average bed thickness was not necessarily the same; i.e. measured thicknesses for nominal ½, 1, and 2-inch units were 0.72, 0.98 and 1.82-inch, respectively. The total quantity of fiber, however, 0.22, 0.45, and 0.92 lb was almost in direct proportion to the nominal filter thickness. Fiber packing densities based upon the measured filter thicknesses were 1.42, 2.1, and 2.3 lb per cu ft.

Filter resistance at rated air flow of 800 cfm averaged 0.037, 0.075 and 0.13 inch of water for nominal ½, 1, and 2-inch units, respectively. Corresponding efficiencies based upon individual particle counts ranged from average values of 50 to 91%. Differences in pollen concentration, which ranged from 281 to 2430 particles per cubic yard during these tests, did not appear to influence the efficiency. Figure 5 shows graphs of average penetration (100% efficiency) plotted against total weight of fiber in the filter. Since this relationship could be represented as a straight line on semi-log paper, Curve *A*, it appeared that pollen removal for the indicated filters followed the logarithmic-penetration law as applied to the collection of uniformly sized particles.

Results from Other Filter Tests

Table 2 shows test results for twelve glass fiber filters which were produced by Manufacturer *A* for the purpose of decreasing filter resistance while maintaining the

TABLE 3—RAGWEED POLLEN FILTRATION

Glass Fiber Types—Four Manufacturers

Filter* Thickness (Nominal) and Number	Manufacturer	Fiber Packing Density lb/ft³	Fiber Diameter Microns	Resistance Inches Water	Count Efficiency Per Cent	Penetration Per Cent
26 2-inch	B	0.37	30-50 oiled	0.095	61	39
27 2-inch	B	0.37	30-50 oiled	0.095	68	32
28 2-inch	B	0.37	30-50 oiled	0.095	70	30
29 ½-inch	C	0.51	40 heavily	0.07	53	47
30 ½-inch	C	0.51	40 oiled	0.07	47	53
31 1-inch	C	0.33	40 lightly	0.14	52	48
32 1-inch	C	0.33	40 oiled	0.14	25	75
33 2-inch	C	0.21	40 lightly	0.19	61	39
34 2-inch	C	0.21	40 oiled	0.19	47	53
35 1-inch	D	0.53	35 heavily	0.15	68	32
36 1-inch	D	0.53	35 oiled	0.15	71	29
37 1-inch	E	0.46	40-50 moderately	0.19	52	48
38 1-inch	E	0.46	40-50 oiled	0.18	41	59
39 2-inch	E	0.37	40-50 lightly	0.22	63	37
40 2-inch	E	0.37	40-50 oiled	0.11	23	77

* Filter capacity = 800 cfm. 20-inch × 20-inch frame.

same efficiency levels reported for rigid glass media. Filter frame construction was identical to that described for the rigid fibers, Table 1. However, a finer, flexible glass fiber (35-micron diameter) with considerable curl was employed as the filter media. Fibers were oriented predominantly in a plane transverse to the direction of air flow. With this design, the total weight of fiber in each of the three filter sizes was not directly related to the nominal thickness, i.e., 0.053, 0.077, and 0.145 lb for ½, 1, and 2-inch sizes, respectively. Corresponding packing densities based upon measured thicknesses (0.71, 1.01 and 1.96 inch) were 0.34, 0.35, and 0.34 lb per cu ft.

The logarithmic-penetration law applied equally well to the 35-micron diameter fibers as indicated by Curve *B*, Fig. 5. The collection efficiency of the flexible media was approximately the same as that for the coarser, rigid fibers, i.e. 60 to 91% in contrast to 50 to 91% for the latter. Resistance, however, was significantly lower for the 2-inch unit, 0.077 versus 0.13 inch water. Since data reported in Tables 1 and 2 are based upon tests on 25 filters, it is believed that indicated efficiencies and resistances are reliable measures of the performance of filters produced by Manufacturer *A*.

Subsequent data for similar roughing or throwaway type units described in Table 3 involve fewer tests on each design and therefore may not represent typical performance. Filter frames and support construction for all units listed in Table 3 were essentially the same as those reported for the filters described previously.

Several 6-inch x 6-inch sections of filters described in Tables 1 to 3 were photographed against a diffused light background, Fig. 6, to permit a rough comparison of fiber dispersion characteristics.

Filters 26 to 28, Manufacturer *B* 2-inch thickness, containing 30-50 micron diameter fibers, were fairly consistent in performance, 61 to 70% efficient. The basic difference between these filters and the previous group (14 to 25) was in the degree of fiber dispersion. Although individual fiber diameters were about the same, the effective collecting surface of filters 26 to 28, was probably reduced due to the presence of many unseparated yarns.

The product of Manufacturer *C*, filters 29 through 34, indicated inconsistencies in efficiency for nominal ½, 1, and 2-inch models. Although the ½ inch units, filters 29 and 30, showed about the same collection efficiencies, 47-53%, as those determined for competitive products, no

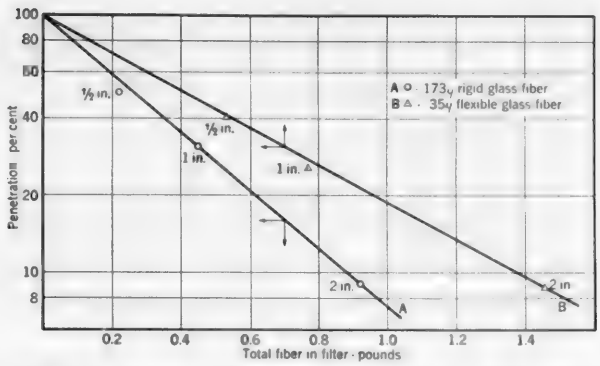

Fig. 5. Ragweed pollen penetration versus total fiber weight for nominal ½, 1 and 2-inch filter thicknesses (Manufacturer A).

significant improvement was noted for the 1- and 2-inch thicknesses. Inspection of this group of filters indicated that the ½ inch units were extremely oily whereas the 1 and 2-inch models were poorly lubricated. The packing consisted of long strands of resin-bonded glass fibers which were not dispersed uniformly thus producing many thin areas. According to miscroscopic sizing, the mean diameter of discrete fibers in these filters was about 40 microns.

Filters 35 and 36, Manufacturer *D*, were similar to units sold by Manufacturer *A* (flexible medial) and Manufacturer *B* insofar as the fiber diameter and its degree of curl were concerned. Although collection efficiencies, 68-71%, were only slightly lower than those for the 1 inch units of Manufacturer *A*, (18 through 21) the resistance was considerably higher, 0.15 versus 0.07 inch water. Fiber surfaces were very oily in comparison to many of the other filters.

Filters 37 through 40, Manufacturer *E*, contained fiber packing that was in large part present as twisted yarns which reduced effective collecting area. Based upon fiber diameter, 40-50 microns, and relatively high pressure loss, 0.19 to 0.22 inch water, collection efficiencies for 1 inch and 2 inch thicknesses were poor in comparison with those of the other filters. Efficiencies for the 2-inch thickness were inconsistent, 23 and 63%, and not much higher than those determined for the 1 inch unit, 41 and 52%. The latter appeared to have a heavier oil coating.

TABLE 4—RAGWEED POLLEN FILTRATION

Metal Screen or Ribbon Types (Viscous)—Three Manufacturers

Filter[1] Thickness (Nominal) and Number	Manufacturer	Wire[2] Packing Density lb/cu ft	Wire Diameter, Microns	Resistance, Inches Water	Count Efficiency, Per Cent	Penetration, Per Cent
41 2-inch	H	14.5	280	0.11	97	3
42 2-inch	H	14.5	280	0.10	96	4
43 2-inch	F	13.0	280	0.10	95	5
44 2-inch	F	13.0	280	0.10	98	2
45 2-inch	G	Aluminum		0.12	93	7
46 2-inch	G	Ribbon		0.13	95	5
47 2-inch	G			0.12	94	6

[1] Filter capacity = 1,200 cfm, 20-inch × 20-inch frame.
[2] Screening oiled by dipping and centrifuging.

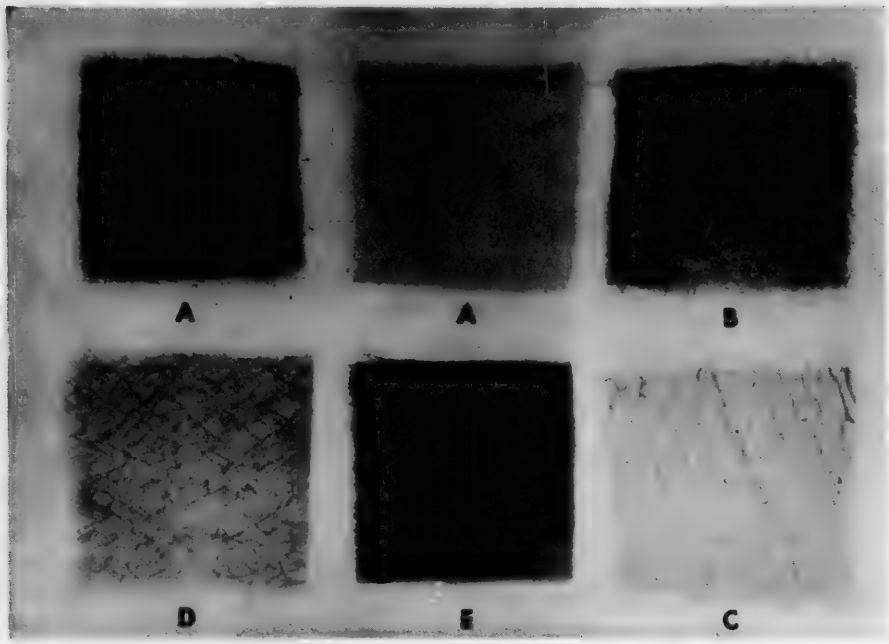

Fig. 6. Sections of filters described in Tables 1 to 3, photographed against a diffused light background.

Table 4 summarizes tests on heavy duty washable type roughing filters commonly referred to as viscous filters. Units 41 through 44, representing two manufacturers' products, were similar both in construction features and performance. Both devices consisted of layers of pleated wire screen packed within nominal 20 x 20 x 2-inch metal frames. These filters were lubricated by oil dipping and allowed to drain 24 hours prior to efficiency tests. Collection efficiency was higher, 95 to 98%, and the resistance only slightly higher, 0.11 inch water than that determined for the glass fiber filters showing the best over-all performance. In addition, the air handling capacity, 1200 cfm, was considerably more than that for the 800 cfm glass fiber types. The cost of these filters, however, is about 8 to 10 times more than that for the glass fiber throwaway types.

Filters 45 through 47 represent a design commonly referred to as a grease filter. It consisted of twisted, oil coated aluminum ribbon packed within a lightweight aluminum frame, 20 x 20 x 2-inch. The three, 2-inch units tested showed consistently high efficiencies, 93 to 95%, for a moderate resistance, 0.12 inch water (1200 cfm).

Pollen tests on a group of dust collectors, which can be classified as moderate to high efficiency pre-cleaners, based upon general performance tests conducted by this laboratory, are reported in Table 5.

Collector 48 consists of a metal frame cell (single or multiple units) containing several pleats of felted, oil treated paper, the performance of which is enhanced by impressing a 12 kv, dc voltage across the fiber surfaces. Tests with and without applied voltage showed better than 99.9% pollen removal. Another product of Manufacturer *B*, collector 49, employs the same electrification technique but in the place of the cellulose media uses a tightly pleated glass fiber paper, 17 micron fiber diameter. Front and rear faces of the filter unit make contact with high voltage and ground electrodes, respectively. A metallized

(Concluded on page 128)

TABLE 5—FILTER PERFORMANCE IN REMOVING AIR BORNE RAGWEED POLLEN, ELECTROSTATICALLY CHARGED MEDIA

Collector Number	Manufacturer	Description Media and Arrangement	Electrostatic Mechanism	Resistance at 1000 cfm Inches Water	Count Efficiency, Per Cent	Penetration, Per Cent
48	B	Pleated, felted cellulose, oil treated	12 KV, DC across media	0.13	99.9	0.1
48a			No voltage	0.13	99.9	"
49	B	Pleated glass paper, 17 μ fibers, jackstraw arrangement	12 KV, DC across media	0.13	99.3	0.7
49a	B		No voltage	0.13	97.0	3.0
50	H	Low voltage, 2-stage, electrostatic precipitator	8 KV ionizer 6 KV plates	<0.1	100	0

COPPER AND BRASS TUBE TERMINOLOGY

Automotive and General Service Tube—Seamless copper tube of small diameter conforming to the standard series of sizes commercially known as automotive and general service tube. It is furnished in soft temper and intended for use in gas and oil lines of automobiles and machines, and for field repairs and alterations.

Bimetal Tube (Duplex)—A finished tube consisting of two different metal tubes mechanically bonded together by drawing one inside the other.

Bourdon Gage Tube—Seamless tube of uniform wall thickness and special (usually oval) cross-section, produced to special dimensional tolerances and special temper for use as a pressure actuated measuring device, as in a Bourdon gage.

Brazed Tube—Tube made from sheet or strip by forming and brazing.

Butt Seam Tube—See Open Seam Tube.

Capillary Tube—Tube of small inside diameter with highest quality of inside surface and to close diameter tolerances. It is subject to special tests to insure precision and uniformity of bore and is specially cleaned and packed.

Condenser Tube—See Heat Exchanger Tube.

Copper Drainage Tube (DWV)—Seamless copper tube conforming to the particular dimensions commercially known as Copper Drainage Tube (DWV). It is intended for above ground use only, for soil, waste, vent, and other non-pressure applications.

Copper Service Tube—Bendable copper water tube for underground water service. See Copper Water Tube.

Copper Water Tube—Seamless copper tube conforming to the particular dimensions commercially known as Copper Water Tube and designated as Type "K", "L", and "M".

Embossed Tube—Tube, the outside surface of which has been ornamented by means of rolling with a design in relief, regularly repeated in a longitudinal direction.

Finned Tube—Tube having a series of metallic ribs on the outside or inside surface either parallel to the longitudinal axis or circumferentially extended from the tube to increase the effective surface area for heat transfer applications. The fins may be mechanically applied, drawn, or integrally extruded from the tube wall.

Fluted Tube—Tube of nominally uniform wall thickness, having regular longitudinal concave corrugations, with sharp cusps between corrugations.

Fluted Outside and Plain Inside Tube—Tube having fluted outside periphery and plain inside periphery.

Heat Exchanger Tube—Tube manufactured to special requirements as to dimentional tolerances, finish, and temper for use in condensers and other heat exchangers.

Lip Tube—Tube of generally circular cross-section with nominally uniform wall thickness having one hollow or solid protuberance or lip parallel with the longitudinal axis, intended for use in heat exchangers, particularly in the dairy industry.

Lock Seam Tube—Tube made from sheet or strip, with a longitudinal, mechanically locked seam.

Oil Burner Tube—Small diameter seamless copper tube of soft temper in coils intended for use in oil burner installations.

Open Seam Tube—A shape, other than extruded shape, of generally tubular form of nominally uniform wall thickness but having a longitudinal unjointed seam or gap of width not greater than 25% of the outside diameter or greatest overall dimension.

Pipe—Seamless—Tube conforming to the particular dimensions commercially known as Standard Pipe Sizes (SPS) and designated as Regular and Extra Strong. See also Threadless Pipe (TP).

Reeded Outside—Plain Inside Tube—Tube having reeded outside periphery and plain inside periphery.

Reeded Tube—Tube of nominally uniform wall thickness having regular longitudinal convex corrugations, either with rounded or sharp cusps between corrugations.

Refrigeration Service Tube—Seamless copper tube in small diameters and conforming to the standard series of sizes commercially known as Refrigeration Service Tube. It is furnished in coils of soft temper with special inside cleanliness, dehydrated, with the ends sealed and intended for use in refrigeration installations.

Roped Tube—Tube of nominally uniform wall thickness, having the appearance of standard rope.

Rope-Fluted Tube—Tube of nominally uniform wall thickness, both fluted and roped.

Rope-Reeded Tube—Tube of nominally uniform wall thickness, both reeded and roped.

Seamless Tube—Tube produced with a continuous periphery at all stages of the operation, in contrast to "brazed", "welded", "open seam" and "lock seam" tube.

COPPER AND BRASS TUBE TERMINOLOGY

Threadless Pipe (TP)—Seamless copper tube of standard pipe outside diameter conforming to particular dimensions commercially known as Threadless Pipe (TP). It is furnished in hard temper, straight lengths and intended for assembly with brazed joints.

Tubular Shape—Tube of non-uniform wall thickness or of irregular periphery or both.

Twisted Tube—Tube of symmetrical cross-section other than round having nominally uniform wall thickness and which has been twisted.

Welded Tube—Tube made from sheet or strip, with a longitudinal welded joint.

Tube Measurement Terms

Concentricity — Concentricity implies coincidence of the centers of the OD and ID. As a practical matter, eccentricity is conventionally measured as the difference between the maximum wall and minimum wall determined at any one cross-section. Studies of commercial tube show that the eccentricity increases with increase of both nominal wall and nominal OD.

Diameter—Average Inside—For all practical purposes, average ID is the average, at only one cross-section, of the maximum and minimum measured diameters usually found at or very close to 90° to each other. Average ID may be obtained for all practical purposes by subtracting twice the average wall thickness from the Average OD.

The great majority of commercial tubes are specified with respect to OD and wall with no direct indication of required ID or tolerance therefor.

Diameter—Average Outside—For all practical purposes, average OD is the average, at any one cross-section, of the maximum and minimum measured diameters usually found at or very close to 90° to each other.

Studies of a very large number of commercial tubes made by a number of producers show that the variation of average OD from its nominal, and therefore a reasonable average OD tolerance, is entirely independent of wall thickness. For instance, average OD tolerance should be identically the same for a tube 1 x ¼ as for a tube 1 x 0.020 inch.

Diameter At Any Point — Inside — Inside Diameter may be measured at any point around the periphery. The variation of ID at any point from its nominal is the result of two independent factors: variation of average inside diameter from its nominal and departure from roundness. However, the total variation found in good commercial practice seldom approaches the maximum theoretically possible from these combined factors. Inasmuch as tube users seldom specify a tolerance on ID at any point, no schedule is established.

Diameter At Any Point—Outside—Outside diameter may be measured at any point around the periphery. The variation of outside diameter at any point from its nominal may be the result of two entirely independent factors namely, the variation of the average OD from its nominal and the departure from roundness. However, the total variation found in good commercial practice seldom approaches the maximum theoretically possible from these combined factors. Inasmuch as tube users seldom specify a tolerance on OD At Any Point, no schedule is established.

Roundness—Roundness implies a truly circular periphery of the inside or the outside surface. Since experience shows the degree of departure from roundness is the same on the OD and the ID, but is more readily measured on the former, it is customary to determine departure from roundness of the OD, even when the tube is specified as to ID only. Out-of-roundness is determined as the total *difference* found at any one cross-section, between the individual maximum and minimum outside diameters which usually occur at or about 90° to each other. *Roundness is not expressed as plus and minus.* Roundness is not to be confused with concentricity, as there is no connection whatever between the two.

Wall Thickness—At Any Point—Wall thickness may be measured at any point around the periphery. The variation of the wall at any point from its nominal is the result of two entirely independent factors; namely, the variation of the average wall from its nominal and eccentricity. The total variation found in good commercial practice seldom approaches the maximum theoretically possible from these combined factors.

Wall Thickness—Average—For all practical purposes, average wall thickness is the average at any one cross-section, of the maximum and minimum wall thickness, usually found at or very close to 180° apart. Studies of commercial tubes show variation of average wall thickness from the nominal is dependent only on the diameter of the tube, and practically speaking, independent of the wall thickness itself; i.e., average wall thickness tolerance should be the same for a tube 1 x 0.100 as for a tube 1 x 0.020 inch, whereas average wall thickness tolerance for any 2-inch diameter tube must be greater than for any 1-inch tube. Inasmuch as tube users seldom specify a tolerance on average wall, no schedule is established.

The foregoing terminology was adapted from material compiled by The Copper and Brass Research Association, New York, N. Y.

Lint-free garments and finger coverings are worn during inspection of parts for bearing assemblies. Area for this critical operation is sealed off from non-critical area.

Environmental Control for Producing Ball Bearings

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Ventilation, air cleaning and refrigeration systems installed at plant of The Barden Corp., Danbury, Conn., manufacturers of ball bearings, to provide proper air conditions for tolerance control, rust prevention on bearings, and air cleanliness.

IN many modern industries, the increasing requirement for stringent product quality control has resulted in thorough reexamination of all of the production facilities. For some time it has been recognized that the accuracy of even the most precise manufacturing equipment may be affected by its environment. The Barden Corporation manufactures super precision ball bearings for use in guided missile units, aircraft instruments and many other industrial and scientific applications wherein deviation from dimensional tolerances would be magnified many thousand fold.

Hot water generators, air compressors and auxiliaries installed in the mechanical equipment room.

When Barden decided it was necessary to build a new plant for the production of these items, one of the major problems was to determine the design criteria for this environment. As operations to be carried on in the different portions of the plant would vary widely, it was logical to assume that the requirements should be varied to suit the particular functions. Conditions in the various areas described separately hereinafter coincide with the initial requirements and could be extended to upgrade adjacent areas as required by future needs within the concept of the original design.

Super-critical Area

The super-critical area, wherein bearings are finally cleaned, tested and sealed in protective inner wrappings, covers approximately 5,000 sq ft floor area. Prevention of moisture condensation on finally finished surfaces, is necessary to avoid rust. A maximum degree of air cleanliness is required.

It was decided that 80 deg d.b. F and 40% relative humidity would best meet the first requirement. The air cleaning system, an integral part of the air conditioning system, consists of throw-away type fiberglas filters on the suction side of the air conditioning unit and electrostatic

Mechanical equipment room showing sealed chilled water units, condenser, and circulating and chilled water piping.

filters in series with Cambridge Absolute filters on the discharge side of the unit. This combination was designed to develop an efficiency of 99% and 0.3 micron particles (a micron is 1/25,000 of an inch). The last two filters, located on the discharge side of the unit and under a positive pressure, would prevent infiltration of dirt-laden air beyond the filters.

Filtering of the supply air was only one facet of the environmental control. To be consistent, the other components in the building were designed with the stringent cleanliness requirements in mind. All partitions were constructed of Masonite, having a very smooth surface. Sash and trim were especially designed so that there were no protruding horizontal surfaces where dust could lodge. All other details were analyzed with the same requirements in mind.

Personnel entering the area could be a major source of dust particles. Therefore, air locks with air baths were provided. They were designed so that a person entering the chamber would have high velocity air streams directed on him at three different levels at sufficiently high velocity to dislodge any dust from clothing or shoes and discharge it into a dust trap below the floor level, where an adhesive similar to the coating of washable type air filters, was used to trap the dirt.

The remainder of the super-critical air conditioning system is conventional and consists of a factory built package air handling unit, containing fans, heating and cooling coil sections and combination filter box and mixing plenum. The distribution system, with the exception of the electrostatic filters and absolute filters, is also conventional with air discharge to the room through ceiling type diffusers.

Critical Area

In the critical area, which covers 32,000 square feet, bearing parts are given final inspection after the machining operations are complete, and the parts are then assembled into finished bearings. In the interest of economy, it was decided to eliminate the use of supply ductwork wherever possible and, in its place, use a pressurized ceiling plenum chamber. Air was then supplied through ceiling diffusers, each connected to a reheat coil by a short section of ductwork. The plenum chamber is maintained at a pressure of 0.16 inch water gage above the area served, which in turn is maintained at a slightly higher pressure than the adjacent manufacturing area. As this area is also maintained at 80 deg d.b. and 40% r.h. it is necessary to sub-cool the supply air and then reheat it to obtain humidity control. The reheat is provided by heaters at each diffuser. The heating medium is 240 deg hot water and is available both summer and winter. The solar load on the roof provides an appreciable part of the reheat on warm summer days and, in order to take advantage of this, only ¾ inch thick fiberglas roof insulation was used. On cloudy days, however, the greater portion of reheat is provided by the coils. The plenum chamber supply system resulted in considerable saving in ductwork and also resulted in great flexibility as variation in partition locations can be made quite easily. Some of the savings in duct work were offset by the additional cost of providing an air-tight ceiling, which required caulking around any hangers or other items penetrating the ceiling. Another by-product of this design on the plus side is that the ceiling acts as either a radiant cooling or heating panel, depending upon the temperature relationship between the plenum and the room.

Machine Shop Area

About 45,000 sq ft floor area are used for the machine shop. A study of this area indicated that it would be uneconomic to provide a complete air conditioning system for this operation and after evaluating various methods of providing ventilation, it was decided that a partial air conditioning or cooling system would provide a greater number of comfortable working hours per year than straight ventilation. The partial cooling system provides a percentage of the volume required for a complete system and also utilizes a percentage of the refrigeration tonnage required for a complete system. In the future, if it is desired to install a complete air conditioning system, it will only be necessary to supplement the existing units with additional similar units and not scrap any of the original installation.

Refrigeration Machines

Chilled water is supplied to the various air conditioning units by two hermetically sealed centrifugal chilled water machines, each having a capacity of 175 tons of refrigeration.

Installation of plenum chamber with supply duct assembly and sub-master thermostat to control the leaving-air temperature.

Estimating the Cost of

Boiler Plant Operation For a Small Hospital

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Albert E. Peters Associates, Scranton, Pa.

The problem of designing a new boiler plant for an existing hospital creates, for the consulting engineer, many interesting problems both in engineering and economics. In the process of making an estimate of annual operating costs for such a project, this office developed three formulas which can be applied to hospitals, schools, and similar institutions using steam for heating and processing.

PLANS for new or remodeled medium-sized boiler plants frequently require an accurate cost estimate by the design engineer. This is especially important to the management of tax-supported and non-profit institutional operations. Recently, this office was required to design a new boiler plant for the Moses-Taylor Hospital in Scranton, Pa. In the process of making an accurate estimate of annual operating costs, three formulas were developed which can be applied to hospitals, schools and similar institutions using steam for heating and processing.

These formulas are: (1) Annual cost of heating fuel, (2) Annual cost of process fuel, and (3) Total annual operating cost. Such an economic determination also served to corroborate final recommendations of the various components and combinations to be used.

1. Annual Cost of Heating Fuel

Any equation used for estimating heating fuel consumption must provide for the use of variables which can be accurately forecast as well as known constants. It must take into consideration the following:

1. Heating load—expressed as EDR radiation or boiler horsepower equivalent.
2. Heating value and efficiency of the fuels being considered.
3. Unit cost of fuel—per ton, per gallon, per cubic foot.
4. Average number of degree days and design temperature.
5. Minimum temperature recorded for the area.

Heating values of such fuels as anthracite, residual oil and natural gas are well established. In the matter of fuel utilization efficiency, experience has developed the following:

Fuel	Percent Efficiency
Anthracite stoker-fired	70
Residual oil	78
Natural gas	80

The heating load as determined by our survey was 18,192 sq ft EDR steam radiation or 130.7 boiler horsepower.

The annual cost of heating fuel can be expressed by the formula:

$$CH = \frac{24cQD}{1{,}000{,}000\ (t_r - t_o)}$$

where:

- CH = annual cost of heating fuel.
- c = cost per million Btu output.
- Q = Btu per hr for design maximum day.
- t_r = inside temperature (deg F) for design maximum day.
- t_o = outside temperature (deg F) for design maximum day.
- D = degree-days based on a period of one year.

The value for *c* for No. 1 Buckwheat anthracite stoker-fired was determined as follows: Useful heat per ton = heating value per ton × percent efficiency. Experience with this fuel in automatic equipment gives the following:

Heating value = 13,200 (Btu per lb) × 2000 (lb per ton)
Efficiency = 70%
Cost per ton = $9.00
Useful heat per ton = 13,220 × 2000 × .70
= 18,500,000 Btu

$$\text{Cost per million Btu} = \frac{\$9.00 \times 1{,}000{,}000}{18.5} = \$0.486$$

Therefore, with 6047 degree days for Scranton, Pa.,

$$CH = \frac{24 \times \$0.486 \times 130.7 \times 33480\ (\text{Btu per bo-hp}) \times 6047}{1{,}000{,}000\ [70 - (-5)]} = \$4100$$

2. Annual Cost of Process Fuel

The new boiler plant is to furnish process steam at approximately 120 psi saturated for the following facilities:

Unit	Load-Lb Steam per Hr
Laundry including hot water	2652.0
Central supply sterilization	170.0
Operating room sterilizers	275.0
Main kitchen	1207.5
Nurses' dining room	448.5
Total process load	4753.0
Boiler horsepower equivalent	146.4

The annual cost of process fuel may be expressed by the following formula:

$$CP = \frac{8760\ cUQavg.}{1{,}000{,}000}$$

where:

CP = Annual cost of process fuel
c = Cost per million Btu output
U = Use factor = 70%

The value of Q average was determined as follows:

$$Q\ avg. = Q_u \times K$$

where:

$$K = \frac{\text{Temperature difference-average day}}{\text{Temperature difference-design day}} = \frac{50}{70}$$

$$Q_u = 1.2\ (Q \times .80)$$
$$= 1.2\ (146.4 \times 33480 \times .80)$$

c = $0.486 per million Btu for No. 1 Buckwheat

Then, by substitution in the formula:

$$CP = \$11{,}200$$

3. Total Annual Operating Cost

Fuel cost alone is not, of course, a true index of cost unless it includes several other important items. The estimate for the Moses-Taylor plant included such items as labor, maintenance and repairs, and electric power.

Item	Total Yearly Utilization Cost
Heating fuel	$ 4,100
Process fuel	11,200
Labor	2,000
Repairs and replacement parts	500
Electrical power	900
Total	$18,700

Total annual operating cost is important to hospital management if they are to be prepared to meet expenses which may occur on a somewhat irregular basis. The major item here is that of amortization and depreciation of the boiler plant components. Since the normal life expectancy of these units is a variable, the equipment was first classified into the following categories: 30-year, 15-year and 5-year life. For the anthracite stoker-fired plant which was ultimately selected, these classifications were used with the preliminary equipment cost estimates.

Total annual operating cost was then determined as shown in next column.

Generally:

Total Annual Operating Cost = Depreciation + Average Interest + Utilization Cost

Specifically:

$$A.C. = \frac{(P_t - L_t)}{N} + (P - L) \times \frac{i}{2} \times \frac{(N+1)}{N} + L \times i$$

For 30-year items

$$+ (P - L) \times \frac{i}{2} \times \frac{(N+1)}{N} + L \times i$$

For 15-year items

$$+ (P - L) \times \frac{i}{2} \times \frac{(N+1)}{N} + L \times i$$

For 5-year items

+ Utilization Cost

where: A.C. = Total annual operating cost
P_t = Total cost for 30-year period
L_t = Salvage value (10% P_t)
N = Number of years of equipment life
i = Interest rate = 5%
P = Initial cost for specific period
L = Salvage value (10% P)

In the group of 30-year life expectancy are such items as boilers, soot blowers, boiler feed pumps, feed water treatment equipment, traps, valves and combustion controls.

Items in the 15-year group include stokers, coal and ash handling equipment and stack improvements.

Finally, in the 5-year group are boiler breeching, boiler base and insulation.

For the stoker-fired plant, the group totals are:

30-year life expectancy	$101,850
15-year life expectancy	17,300
5-year life expectancy	5,700

Total cost over the 30-year period equals $101,850 + 2(17,300) + 6(5,700) or $170,650.

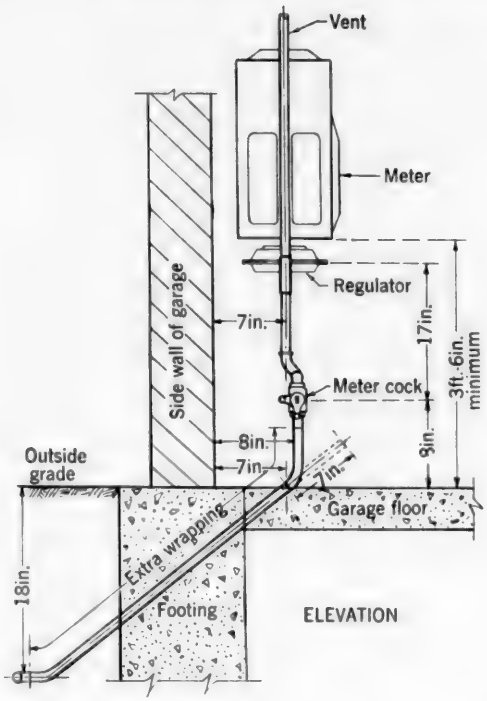
Therefore, by substitution:

A.C. =	$7,997	For 30-year items
+	502	For 15-year items
+	182	For 5-year items
+	18,700	Utilization Cost
	$27,381	

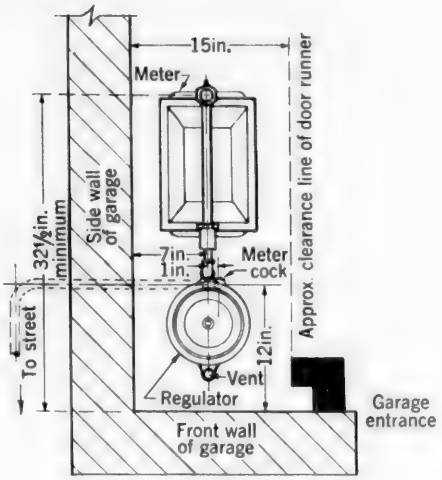
Total annual operating costs for stoker-fired Buckwheat anthracite were below the estimated costs for other fuels considered.

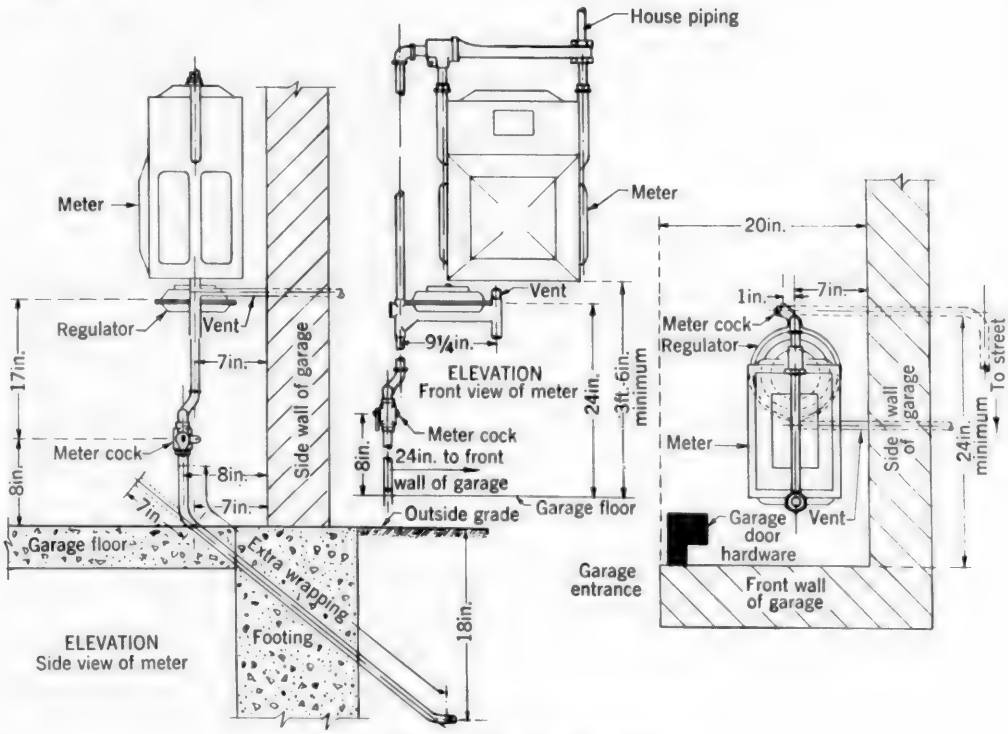
The application of these economic evaluation formulas has been found to be very valuable in engineer-client relationships for this office. School boards, hospital trustees, and many similar public bodies can understand how fuels, equipment, and components are selected for lowest annual cost.

GAS METER HOOKUPS FOR GARAGES



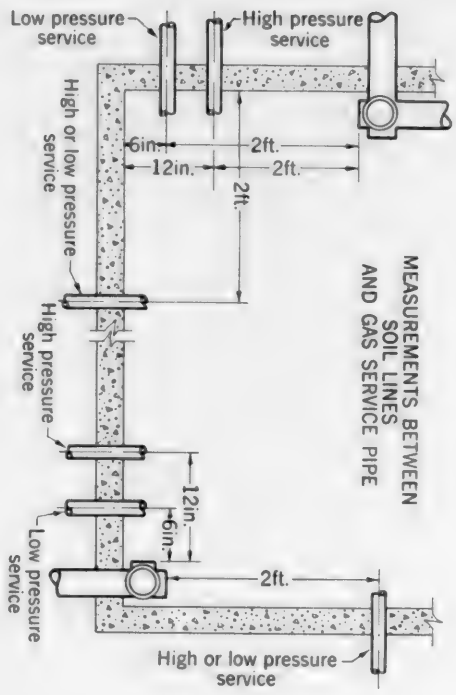
Minimum requirements for gas service installation in garages

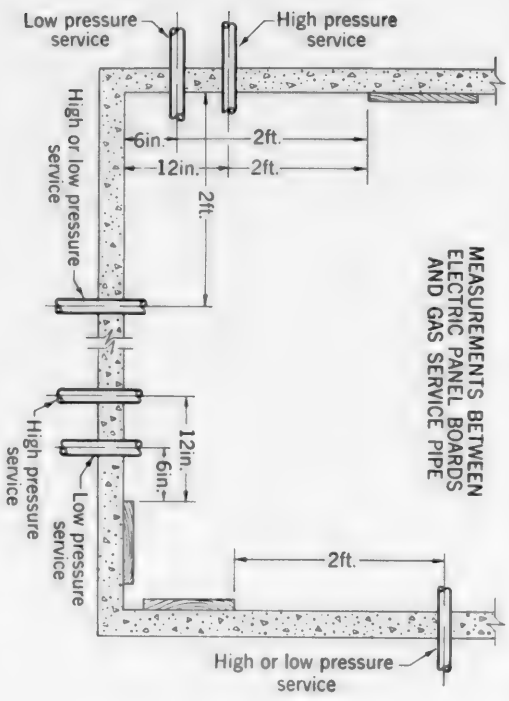


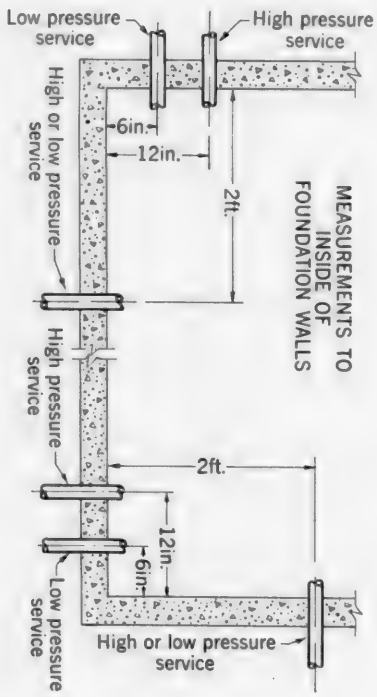


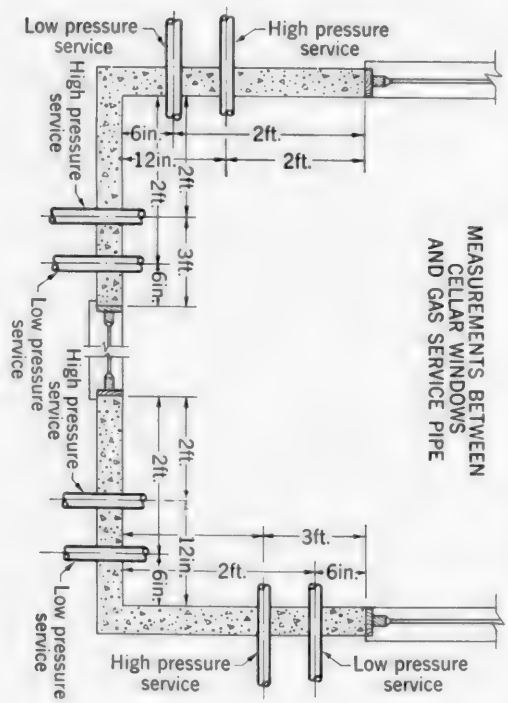
Drawings on This and Next Page, Courtesy of Long Island Lighting Co., Mineola, N. Y.

GAS SERVICE INSTALLATION DETAILS









Air Conditioning Bowling Centers

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At one time bowling was a limited cool weather sport. Air conditioning has increased the number of months that this recreation is enjoyed; added interest in bowling has resulted in more alleys and the development of alleys into recreation centers. This is an extensive article for the engineer who wants information on how to air condition bowling centers, the systems that may be considered, and factors that govern their selection.

TO even the casual observer, it is readily apparent that bowling has been steadily increasing in popularity with each passing year. Bowling centers, both large and small, have sprung up all over the country to serve the approximately 25 million people who are devotees of the sport. Figures from the Bowling Proprietors' Association of America show the trend. In 1948 there were 5,700 establishments with 46,000 lanes; in 1958 there were 7,900 establishments with 77,000 lanes. These statistics, indicating a 67% increase, cover only alleys sanctioned by the American Bowling Congress for competition play. There are about 13,000 bowling establishments operating today, and a leading manufacturer of bowling alley equipment states that kegling will become a billion-dollar business for the first time during the 1958-1959 season. This estimate includes bowling fees, personal equipment, and investments by the proprietors.

Factors Affecting Design

Most new bowling centers being built today include air conditioning; existing bowling centers are modernizing by installing summer cooling to meet the competition of newer lanes. A short time ago, it was common for bowling centers to close for the summer, but with air conditioning, the bowling center owner can operate at a profit during the hot summer months. The comfort provided by a good air conditioning system also encourages patrons to remain in the establishment for food and refreshments, further increasing the profits from the bowling alley.

Air conditioning of bowling alleys presents no unusual problems, but there are several factors which should be kept in mind when designing a system to provide optimum comfort. They are:

1. High concentration of people.
2. Requirement for a high ventilation rate.
3. Desirability of zoning spaces other than the bowling and spectator area.

Bowling alleys are treated much like "spot cooling" applications in that only the space occupied by the bowlers and spectators is conditioned. The heavy concentration of people in this portion of the building localizes the load, so that much of the total space within the building need not be cooled. The cooling load in this area is substantial with both high sensible and high latent heat gains, and for this reason many bowling alley jobs do not fall readily into what is termed the small commercial class.

Because of athletic activity and heavy smoking normally associated with the sport, a high ventilation rate is necessary to maintain air freshness. Cooling and dehumidification of ventilation air imposes an appreciable load on the system.

Most medium-size and larger bowling centers include a restaurant and bar, locker rooms, offices, and sometimes even a nursery. Such spaces deserve special attention when designing anything but a minimum system. Separating such special-purpose rooms from the bowling area by zoning techniques is always desirable.

Estimation of Cooling Load

The cooling load estimate, while it is important and necessary for the intelligent design of a system, will be covered only as is necessary to highlight those details

Modern bowling centers, with many alleys, are serving the devotees of this sport.

peculiar to bowling centers. Primary emphasis will be placed on cooling requirements for the bowling and spectator area, while other spaces, such as the restaurant and offices, will not be considered in detail. For a quality job, these spaces normally should be zoned, and separate cooling load calculations should be made for each zone. It may also be advantageous to zone for year-round operation, where one system will heat the restaurant, offices, and locker rooms, and the other system will cool the bowlers. Zoning will be discussed in more detail.

Savings in Design

Outside design conditions for all localities have been well-established by the American Society of Heating and Air Conditioning Engineers. The design dry bulb and wet bulb temperatures are those which normally occur at 3 pm (sun time) on a design day during July. However, the cooling requirements for bowling centers are usually greatest between 7 and 9 pm when most of the bowlers are present. The outside air is cooler at this time, but the moisture content usually has not changed appreciably. Unless the proprietor indicates his desire to provide perfect comfort for a full house on a hot July afternoon, the cooling load estimate may be based on outside design temperatures corrected for 8 pm. The amount of correction depends on the average daily dry-bulb temperature range for the locality, and appropriate data should be consulted. As an example, in Omaha, Neb., the outside summer design conditions are 95 F db and 78 F wb, with an average daily dry-bulb range of 20 deg F. Correcting these conditions for 8 pm clock time (7 pm sun time with daylight saving), the proper design conditions to use in the load estimate would be 90 deg db and 76.5 deg wb.

Optimum inside design conditions for the bowling and spectator area are somewhat difficult to pinpoint. Commercial practice suggests maximum design conditions of 80 deg db and 50% relative humidity, but for a deluxe job, design conditions of 76 deg db and 55% rh could be used. Because bowling centers have high latent heat gains, the choice of a low db and high rh design condition will usually result in an economical equipment selection with little compromise of comfort. Effective temperature should be between 69 and 73 deg. Generally, an inside design condition of 78 deg db and 60% rh is suggested as a starting point for the load calculation.

The cooling load due to the people present in the space is appreciable, for in addition to the five bowlers on each alley during team play, spectators are usually seated behind the bowlers' benches. The proprietor may be able to estimate the average number of spectators normally present, but in lieu of reliable figures, use eight persons per alley for load calculations. Do not apply the same heat gain factor for each of the eight people. Table 1 gives heat gain due to people in a bowling alley at a temperature of 78 deg db, and may be used as a guide. This table assumes that for each alley one person will be bowling, one standing and six sitting.

Because of heavy smoking and considerable activity, substantial quantities of outside air must be introduced into the space to combat smoke haze and odors. The absolute minimum of 15 cfm per person is not recommended. A ventilation air quantity of 20 cfm per person is desirable; 25 cfm per person for deluxe jobs.

TABLE 1—HEAT GAIN DUE TO BOWLERS

Activity	Heat Gain per Person, Btu per hr	
	Sensible	Latent
Bowling	485	965
Standing	220	280
Sitting	216	185

Under typical conditions adjusted for evening hours, each 1,000 cfm of ventilation air drawn into a bowling center from the outside, requires two tons or more of refrigeration for cooling and dehumidification. It may be definitely advantageous, especially in localities with high outside design temperatures, to place activated carbon or electrostatic filters in the system to reduce the amount of outside air needed. Electrostatic filters will remove tobacco-smoke particles, and activated carbon will remove odors, but all of the return air need not be treated by such filters. For example, a ventilation rate of 25 cfm per person may be planned for a deluxe job. The actual rate could be reduced to 15 cfm per person by using a bypass to take 10 cfm of return air per person through an electrostatic filter. Consult a filter manufacturer for specific recommendations.

Filters Reduce Air Load

An interesting filtering arrangement was used at the Westview Bowl, Waco, Texas. Designed and installed by the Jacobs-Cathey Company of Waco, the air conditioning system furnishes a total of 28,000 cfm supply air to the spaces. According to engineering design data, 12,000 cfm of outside air (20 cfm per person) should be supplied and exhausted by positive means in order to eliminate smoke and odors.

The toilet, locker room and range hood exhaust systems remove a total of 4,000 cfm, and an additional 4,500 cfm is exhausted by four fans located in the rear wall of the building behind the automatic pin-setters. Since 8,500 cfm is exhausted at all times, the same amount is supplied directly to the equipment rooms containing the two large fan-coil units. The equipment rooms are used as mixing chambers and return air plenums. Separate, cleanable filters are installed in the outside air duct, while the recirculated air, entering the equipment room through a wall grille, first passes through cleanable filters, and then through a bank of activated carbon filters before mixing with the outside air. This method provides for the mechanical filtration of both the outside and recirculated air, but only the recirculated air passes through activated carbon.

The 8,500 cfm of outside air supplied and exhausted is 70% of the 12,000 cfm of ventilation air necessary to remove smoke and odors. Thus an odor removal efficiency of only 30% was required to handle the remaining requirements. The activated carbon filters for the recirculated air on this job are standard 2¾-inch thick units with an odor-adsorption efficiency of 30%. Since 3,500 cfm of outside air was not needed by using this arrangement, required capacity in this case was reduced by 14 tons of refrigeration. The combination of outside air and carbon filters provides excellent control of smoke and odors for this installation.

Cool Back of Foul Line

It has become common practice in designing bowling alley systems to cool only the area in back of the foul line.* A phantom curtain is considered to exist from ceiling to floor at the foul line, with relatively little heat transfer through it. The load estimate should include this heat gain based on a factor of 6 Btu per hr per sq ft of cross-sectional area) width of the building times ceiling height). In using this factor, it is assumed that the dry bulb temperature difference across the curtain is 5 deg. Latent heat gain from this area is not calculated, since in the modern bowling alley equipped with automatic pin-setting machines, there are no appreciable sources of latent heat beyond the foul line. Exhaust air is sometimes taken from the building above the alleys, or through the wall behind the pin-setting machines, and this helps to prevent an excessive build-up of heat in this area.

Some alleys have been designed with plexiglass curtains or frame partitions suspended part-way down from the ceiling. These limit heat transmission to some extent, but their primary purpose is to restrict air movement between the conditioned and non-conditioned sections. The use of a partition is covered later in the discussion of supply air distribution.

* In back of, or behind the foul line refers to the space occupied by the bowlers and spectators. The alleys themselves are in front of the foul line.

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Other Considerations

Other heat gains to be estimated include those due to lights, solar radiation, and transmission through walls and roof, but in all cases, only the occupied area behind the foul line is taken into account. Bowling alleys are typically almost windowless structures, so that infiltration through the doors and any windows can usually be offset by exhausting slightly less air than is introduced through the outside air intake. Be particularly careful of a bowling center with entrance doors at both sides of the row of alleys. Simultaneous opening of both doors on a windy night may result in "tons" of cooling literally being swept out the door. The obvious solution to this problem is the installation of a vestibule around at least one entrance.

Storage or flywheel effect is usually not of significance in air conditioning bowling alleys because of the nature of the load, and because only a small portion of the total area is conditioned.

Refrigeration Load

An analysis of a number of successful bowling center installations indicates that the cooling load may vary considerably. For jobs on which business competition is keen, package equipment has been used to provide an average 1.1 tons refrigeration and 430 cfm of supply air per alley. For deluxe engineered-equipment jobs, about 1.8 tons of refrigeration and 540 cfm of supply air per alley is usually installed. The average for all types of bowling center jobs is 1.4 tons and 480 cfm per alley.

Eight persons per alley is the average "people load," but for deluxe jobs, as high as 19 persons per alley has been figured. Each of the eight persons is supplied with

Bowling has become a sport for the entire family. Large centers have beverage and food dispensing facilities. Photographs, courtesy of AMF Pinspotters, Inc.

an average of 20 cfm of fresh air, with the result that ventilation air was between 30 and 37% of the total supply air quantity.

It must be noted that these figures represent averages of data on jobs of many types installed in all parts of the country, and include only the bowling and spectator area of the bowling center. These averages may be used as a rough check for a cooling load estimate, but they should not be used in lieu of detailed calculations.

Equipment Selection

The design engineer has the choice of two basic types of cooling systems for bowling center jobs. Related to the type of equipment used, these systems are as follows:

1. Self-contained unit (packaged equipment) system. Units are available in relatively fixed increments of capacity. The refrigerant compressor may be included within the unit casing, or it may be part of a package condensing unit located elsewhere. Either water or air could be used as the condensing medium.
2. Engineered-equipment system (sometimes called an applied system). Large fan-coil units, compressors and condensers are separate components matched by the design engineer to suit individual job requirements.

It is possible, of course, to use both self-contained and engineered equipment on the same job with some advantage. Self-contained units could be used in the restaurant, bar, or other small areas, while an engineered-equipment system could be designed for the bowling and spectator area. Some of the important merits and limitations of the two basic systems with respect to bowling center air conditioning are now briefly mentioned as follows:

Self-Contained Unit System

Advantages

1. Flexibility—Units may be installed with or without ducts at locations which make best use of wasted space.
2. Zoning simplified—Separate units may be installed to air condition spaces requiring zoning. For example, one unit alone need operate if only the restaurant is open.
3. Medium cost—Air conditioning with self-contained units is relatively inexpensive when related to the quality and performance of the overall system. Owning and operating costs are moderate but results are good.
4. Operating engineer not required—The operation of a self-contained unit can be controlled by an on-off switch, and in most areas an operating engineer is not required by local ordinances.

Limitations

1. Each unit requires utilities and outside air—On jobs involving multiple self-contained packages, each unit must be provided with electrical wiring, condensate drain piping, outside air ductwork, and condenser water or refrigerant piping.
2. Air distribution less satisfactory—Distribution of cooled air using a grilled plenum is more difficult to control than is a good ductwork system. A curtain wall at the foul line should be installed. The location of units is relatively fixed when using plenum air distribution.
3. On-off control—Cycling the unit on and off is a standard control arrangement, with no means of adjusting the system to varying load conditions except by installing additional controls and equipment. Multiple-compressor units, however, usually can be controlled in stages.

Engineered-Equipment System

Advantages

1. Good balance of components—Selecting from a wide range of evaporator coils, condensers, and compressors, a balance can be made to give both close control of room conditions and an economical selection.
2. Less installed horsepower required—The compressor need supply capacity enough to handle the total load

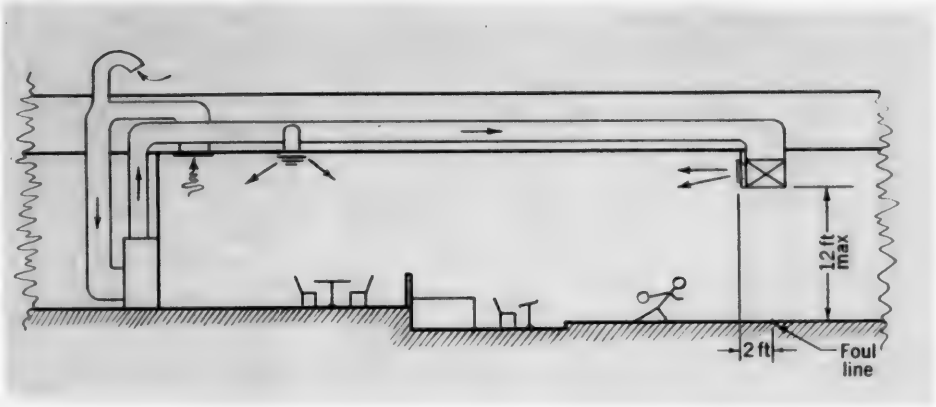


Fig. 1. Preferred method of supplying cooled air to bowling and spectator area. Double deflection outlets are installed in main duct above foul line.

of all zones at peak times, and not the sum of the maximum loads at the peak time for each individual zone for cooling.

3. Excellent humidity control—A compressor with capacity control will be operating most of the time, matching the requirements of partial load conditions. The result is excellent humidity control which is important for comfort in the bowling center.
4. Equipment has long life—Applied-equipment components have an expected normal life of 5 to 10 years more than package equipment.

Limitations and Disadvantages

1. Equipment rooms required—Space is needed for compression equipment as well as the large fan-coil units.
2. Limited air conditioning not available—With a single compressor and two or more fan-coil units, a small, separately-zoned area cannot be conditioned unless the central refrigeration equipment is operating.
3. Somewhat higher first cost—Engineered equipment usually requires a higher initial investment, but operating costs are sometimes lower, and excellent room conditions can be maintained.

Zoning Considerations

The importance of adequate zoning cannot be overemphasized, but is it required for bowling centers? It is, if a restaurant or bar is a part of the premises, and if the owner desires acceptable conditions to be maintained within these spaces at all times. The cooling load in a restaurant or bar differs from the bowling area because these rooms are usually placed at the exterior of the building, and have some glass area. Activity with in the spaces is moderate, so a different temperature level is desirable. In addition, the restaurant or bar may be crowded both before and after the evening bowling hours, but more important, it may also be crowded with the bowlers from the first shift while the second shift is bowling. As a general rule, a restaurant or bar should be zoned in some manner when separated from the bowling and spectator area.

One method of zoning special-purpose rooms is to plan an entirely separate system; very often a self-contained unit will be entirely adequate. Another method, possible when designing a custom-engineered system, is to install a separate fan-coil unit to handle areas other than the general bowling space. Both the fan-coil unit for the main space and the unit for the separately-zoned areas are connected to a single compressor or condensing unit with capacity control. Each zone, of course, has its own temperature control system.

A single fan-coil unit for all areas with a reheat coil in the supply branch to the restaurant or bar may also be considered. Because a restaurant normally requires less, and a bar usually requires more ventilation air per person than does the bowling area, this method is not often used. Zoning by volume control is not recommended, nor is the use of a multi-zone fan-coil unit considered necessary in bowling center design.

One aspect of the zoning problem which must not be overlooked is the necessity of providing comfort in the winter as well as the summer. This may be the deciding factor which will make restaurant zoning imperative in Northern climates. It is entirely possible that the restaurant, locker rooms and offices at the exposed walls of the building may require *heating* during intermediate seasons, while the bowling and spectator area may require *cooling*. With a properly zoned system, acceptable conditions can be maintained in all areas. If heating performance is a primary consideration in zoning, a split system utilizing baseboard radiation along the outside walls is a method of accomplishing desired results.

Zoning Arrangement

An unusual zoning arrangement is part of the air conditioning system installed in the new All-Star Lanes, Salina, Kans., by the Globe Sheet Metal Works of Salina.

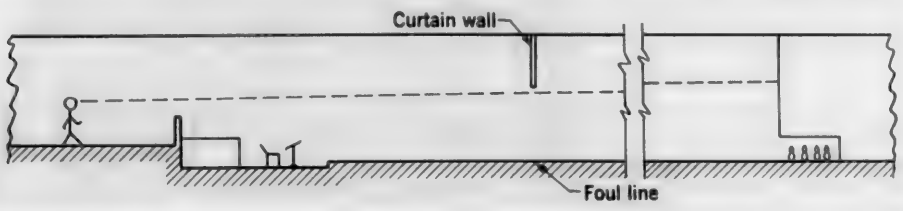


Fig. 2. Suspended curtain wall should not obstruct spectators line of sight.

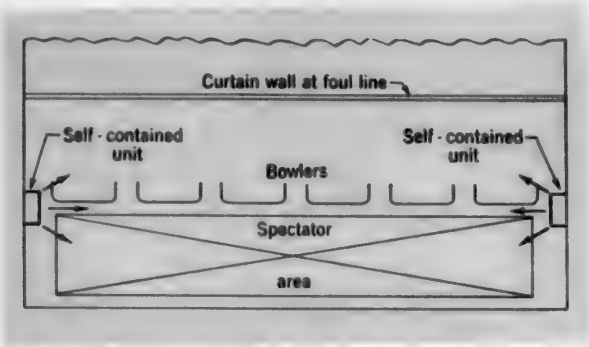


Fig. 3. Self-contained units located at both sides of alleys.

The arrangement is distinctive in that sections of the bowling and spectator area are zoned, using separate systems. Fan-coil units connected to remote air-cooled condensing units furnish air to supply ducts furred-in at the ceiling above the foul line. The bowling area is zoned in eight-alley sections, and each section has its own system with individual control. The bowling center manager can regulate the air conditioning in any section at a panel incorporating remote controls for high or low temperature, continuous or automatic fan operation, night set-back for heating, and exhaust air quantity. The obvious advantage of this zoning method is that operating economy is possible through manual adjustment of system operation to air conditioning requirements at all times.

Air Distribution and Ductwork

As previously mentioned, the air conditioning of the bowling and spectator area is essentially a spot cooling job, and therefore the air-flow pattern within this area must be carefully planned. This section covers supply air distribution methods, return-air arrangements, and suggested means of supplying ventilation air and exhausting stale air.

Supply Air Distribution with Ductwork

The preferred method of supplying conditioned air to the bowling area is to place the main supply trunk duct at the ceiling above the foul line. See Fig. 1. Extending the width of the alleys, the duct is fed from the center, and usually is furred-in. If the ceiling is particularly high, the duct should be suspended so that it is not more than 12 ft above the floor. Sidewall-type outlets with double-deflection vanes should be attached to short collars installed on the side of the duct. Very little air from the unconditioned alley space is induced by the cooled air stream using this type of outlet and duct arrangement. Preferably not more than two alleys should be served by one outlet; for deluxe systems, an outlet above each alley is better. The location of the outlet with respect to the foul line is critical. Usually the outlet face should not be more than 2 ft in front of the foulline, but this is largely dependent on the diffusion characteristics of the outlet and the width of the area it serves. The deflecting vanes of the outlet should be set to throw the conditioned air straight out through the top portion of the grille, and downward toward the bowlers through the bottom portion. Side deflection is adjusted to meet requirements. Ceiling diffusers on branch runs could be used to blanket the areas behind the spectators not reached by the outlets in the main trunk. While this distribution method has been found to give good results, the architect or owner may object to a suspended, furred-in duct. It should be pointed out that the duct enclosure provides an excellent location for mounting advertisements, team records, and the screens used for the projection of score sheets.

With careful design, satisfactory results can be achieved by using round or rectangular ceiling diffusers. Semicircular and two- or three-way rectangular diffusers are particularly desirable. When using these outlets, it is advisable to suspend a curtain or partition from the ceiling at the four line to restrict the movement of cool air to the conditioned area, and to prevent the diffusers from inducing warm air into their jet streams. Heavy transparent plexiglass has been used successfully as a curtain on jobs where the owner desired an unobstructed view of the pin area. A frame partition is a more permanent barrier, and if not extended too low, will still permit both bowlers and spectators to see the action at the pins and the lighted pin indicator at the far end of the alleys. It is not possible to make a general recommendation concerning the height of the partition above the floor. It should extend as far below the ceiling as possible, yet should allow all the spectators behind the players' benches to see the pins, as illustrated by Fig. 2. The partition can also serve as signboard or score-sheet projection screen.

Supply Air Distribution with Self-Contained Units

When self-contained air conditioners are chosen for an installation, it is possible to use either of the two ductwork air distribution systems described previously. For the small bowling center, however, it may be less expensive to use self-contained units with discharge plenums for distributing the cooled air. Results are not always as good, but are usually satisfactory for the small job. Inspection of the air conditioner-manufacturer's data should be made to determine if the unit or units can adequately cover the area with cooled air.

There are three different arrangements of self-contained units with discharge plenums which can be considered. A curtain wall above the foul line is recommended with each of these. In the first arrangement, illustrated by Fig. 3, units of equal capacity are placed at the walls on both sides of the alleys, and the cooled air is directed to the center of the bowling and spectator area.

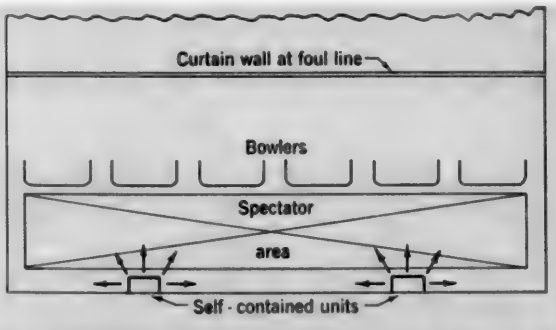


Fig. 4. Self-contained units located at wall behind spectator seating.

The second arrangement consists of units placed against the wall behind the spectator seating, and air is directed out of the plenum in a spreading pattern. See Fig 4. Grilles should also be placed on the sides of the plenums to further direct the air to all parts of the conditioned area. The third arrangement consists of a single unit, and is recommended only for bowling centers with less than nine alleys. The best location when only a single unit can be used is at one of the side walls, Fig. 5. If space for a unit at the side is not available, the alternative is to center the unit on the wall behind the spectator area. Grilles should be installed on the sides of the discharge plenum, and the air flow must be carefully regulated to provide the best distribution possible with this arrangement.

Floor-Mounted Units

A variation of these arrangements was installed at the Franklin Bowling Lanes in Evansville, Ind., by George Koch and Sons, Inc., Evansville. This bowling center consists of 20 alleys side-by-side, with the spectator area behind the bowlers' benches, as in Fig. 3. To air condition the bowling and spectator area, four floor-mounted self-contained units with discharge plenums were placed within the area. One unit was placed at each end of the row of bowlers' benches, as in Fig. 3, and the other two units were set against the back wall, as in Fig. 4. Air is returned to the units through grilles in their front panels.

By carefully adjusting and regulating the discharge air distribution pattern, a curtain wall suspended from the ceiling over the foul line was found to be unnecessary. The four units properly located gave good air distribution throughout the area.

Return Air

The best location for return-air grilles is the ceiling, or high in the wall behind the spectator area. Multiple grilles should be installed so that air is returned from all parts of the conditioned area. Avoid return air locations near a snack bar because cooking odors may be picked up, even though all appliances may be hooded with connections to an exhaust system. If floor-mounted self-contained units are installed within the conditioned area, return air is usually taken into the unit through grilles in the front panels of the units, or through openings in the rear.

Exhaust Air

The exhaust air location and arrangement assumes substantial importance in the design of a bowling center system. The greater portion of the total exhaust air quantity should be moved out of the space by fans. Since the purpose of exhausting air is to remove smoke and odors, most of the air should be taken through grilles in the ceiling above the bowling and spectator area, especially if a curtain wall is extended from the ceiling near the foul line. Sometimes a job is designed with fans in the ceiling above the alleys themselves. By thus removing a part of the exhaust air from points above the alleys, there is less possibility of "smoke haze" developing and remaining over the lanes. In addition, the slight air movement from the conditioned to the unconditioned area will help overcome the transfer of convected heat to to bowling and spectator area.

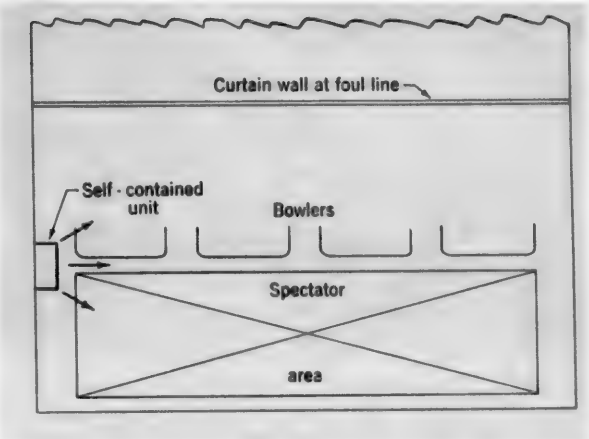


Fig. 5. Self-contained unit located at one side of small bowling center.

Although it may be convenient to exhaust air from the bowling and spectator area out through the locker rooms or kitchen, these spaces should have their own ventilating system. Smoke-laden air tends to collect near the ceiling, and it should be removed at this point.

Ventilation Air

Ventilation (make-up) air should always be introduced into the conditioned space through ductwork leading to the return air inlet of the fan-coil or self-contained unit. It should be filtered and thoroughly mixed with the return air before it enters the cooling coil.

Sometimes on larger jobs it is not uncommon to find a ventilation cycle included in the overall design of the system. By providing for the introduction of fresh air up to the normal air-handling capacity of the unit fan, the system can provide cooling without refrigeration during intermediate seasons, and quick freshening of the interior during the summer and winter. If a ventilation cycle is not provided, consideration could be given to the use of two-speed exhaust fans and two-position outside air dampers to accomplish the quick flushing manually on high speed when required.

Heating

Only brief comments are necessary relative to heating methods and equipment. The desirability of zoning spaces adjacent to outside walls for good heating conditions has been mentioned in previous discussion.

Many bowling center air conditioning units are installed with heating coils, fed from a hot water or steam boiler. Supplementary baseboard fin radiation could also be supplied from the same boiler. Building entrances should receive special attention in cold climate zones, as should the exposed walls at the sides of the bowling and spectator areas.

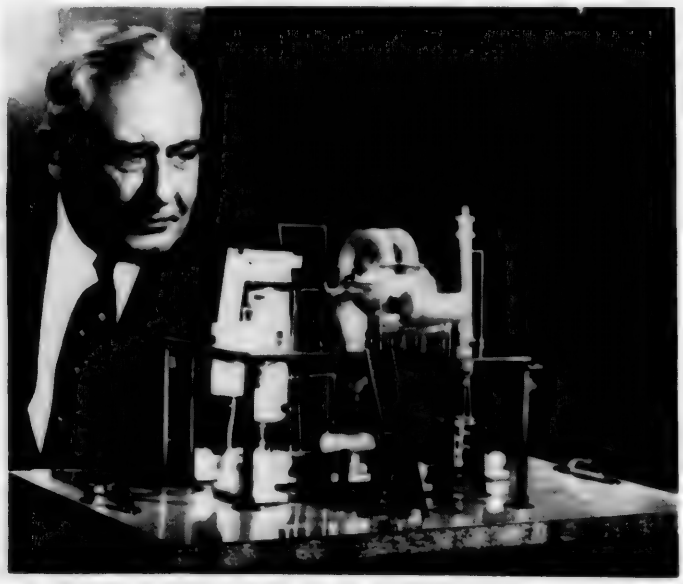
Gas-fired duct heaters have proven popular in bowling alley work. Installed in the supply air ductwork, they are less expensive than a boiler and heating coils, but their output cannot be as closely controlled.

At the Strike N' Spare Bowl, Springfield, Ill., the Punzak Air Conditioning Company of Springfield installed electric resistance heaters. Each heater bank is controlled in three stages.

Picture Paragraphs

▲ SUN LOUVER SYSTEM. The adjustable aluminum sun louver system which shades the eastern and western faces of the new home of Reynolds Metals Co., in Richmond, Va., is the largest sun louver installation in the world. Gray on the outside and blue on the inside, the louvers, 880 in all, are 14 ft high and 22 inches wide. Louvers change position several times during the day; their rotation is only slightly in advance of the sun's movement so that minimum restrictions are placed on viewing and the entering daylight. Seasonal changes in sun angles require periodic corrections in the daily program of louver movements; these corrections are made by a master clock so that louver operation is automatic the year around. The control system, designed and installed by Lemlar Mfg. Co., Gardena, Calif., also provides for cloudy weather. Reduced light intensity from cloud overcast will cause photoelectric units to countermand (after 3-min time lag) the program control of the louvers and turn them perpendicular to the building to admit maximum light. Return of sunlight lets controls take over.

▼ TO MAKE SEAWATER FRESH. A model of the pilot plant for converting salt water to fresh, which will be built by Carrier Corporation under a U.S. Interior Department contract, is inspected by Cloud Wampler, chairman of the board of Carrier. Unit will freeze seawater, converting it to a slush of pure ice crystals and brine. Brine is then removed and the ice melted to obtain fresh water. As described in Scientific Frontiers, in last month's issue of *Air Conditioning, Heating and Ventilating*, plant is designed to produce 15,000 gallons of fresh water a day.



▲ HOT-COLD-LIGHT PANEL. This full-scale panel, developed by Westinghouse Electric Corp., is seen holding promise to light as well as heat and cool the home of the future. Demonstrated here by Chris J. Witting, vice president in charge of the consumer products group, the panel combines the latest advances in electroluminescent lighting and thermoelectric heating and cooling. Patterns or "mobiles" of anodized aluminum are superimposed upon the Rayescent screen to provide the required surface area on the panel for heating or cooling a room. Light from the screen may be varied in intensity and, in addition, changed in color.

Centrifugal Pump Troubles

IGOR J. KARASSIK and ROY CARTER
Harrison Division, Worthington Corp.

This is Part 2 of a two-part article, and the final article of a series on the installation, operation and maintenance of centrifugal pumps that started in the July, 1958 issue. While the previous article covered noise in centrifugal pump installations and the means to reduce or eliminate this noise, this article considers the problems which might arise from mechanical causes.

OBVIOUSLY, the presence of foreign matter in the impeller or casing of centrifugal pumps can lead to serious trouble and, therefore, should be prevented unless the pumps are specifically designed to handle such material. Strainers or screens should always be located in the suction line if such foreign matter may be expected in the liquid handled by the pump. Even when under normal operation, the presence of foreign matter is unlikely—as, for instance, in the case of boiler feed pumps. However, welding beads, bolts, nuts and similar extraneous objects find their way into the pump section in the early stages of operation, no doubt because the piping up of the pump takes place sometimes without precautionary flushing out of the suction piping. Temporary screens or strainers should therefore be used in all pump installations. After the pump has been in successful operation for a period of time, the screens may be removed.

If the suction eye on one side of a double suction impeller becomes completely clogged, it will reduce the pump capacity approximately by one-half. A complete blocking of one side would not impose an excessive load on the thrust bearing as there will exist little difference in pressure on the two eye areas. A partial blockage of one or both sides, however, often results in throwing the rotor out of balance and may impose an additional load on the bearings.

Misalignment and Damage to Internal Parts

Misalignment difficulties should never be permitted to take place and there is absolutely no excuse for not following properly the instructions provided to that effect by the pump manufacturer, instructions which are generally explicit and not difficult to follow. Besides its obvious effects on the pump bearings, serious misalignment will frequently interfere with the proper functioning of the stuffing boxes and will impose a severe stress on the shaft, leading to occasional failure of the latter through fatigue.

While in some cases, a pump may develop mechanical troubles when first started due to rubbing of rotating parts, bent shaft, damaged internal parts, defective casing gaskets, rotor out of balance and other causes, such cases are exceedingly rare. Most of these accidental failures would be discovered prior to shipment during the test at the manufacturer's plant. They can, however, take place after a pump is dismantled and reconditioned in the field. This should not be construed as a criticism of the maintenance personnel in general, but rather as a recognition of the fact that personnel which engages in such maintenance work at infrequent intervals cannot be expected to be as familiar with the necessary operations and precautions as the workmen engaged in the same work day in and day out.

Probably first on the list of the difficulties which may occur in field reassembly of rotors is the negligence of the precautions necessary to prevent contact between the rotating and the stationary parts. Starting up a pump which has not first been thoroughly checked for the concentricity of the rotating element with the stationary parts may easily lead to a damaged or even seized rotor, especially if the pump is stainless steel fitted, as such materials gall easily on making contact.

Another practice which may, under some conditions, cause the binding of a rotor in its internal clearances, is the starting up of a pump which handles high temperature liquids without first warming it up thoroughly, running it at a very reduced speed (say ½ or ¼ of normal) a number of times and letting it run down to several stops by cutting off the power. The reason for the pump seizing in such a case is that if any internal parts are rubbing even very slightly, heat is generated and when the pump is not up to speed, there is not enough liquid going past the internal clearances to keep the contacting element cooled. When the power is cut off at that moment, the rotor will lock solidly in the wearing rings while rolling to a stop. As a result, it is recommended that when a pump is started up cold or only partly warmed up, the unit should be brought up to full operating speed and kept going by all means. If, through faulty internal alignment, a momentary contact does take place, the chances are that the pump will not seize, assuming that the contact is slight.

If the axial contacting faces of impeller hubs, shaft sleeves and shaft nuts are not 100% perpendicular to the bores of these parts—such 100% alignment is difficult to attain in the field without very accurate machining facilities—excessive tightening up of the shaft nuts will lead to bending of the shaft and potential contact of the rotating parts. For this reason, a reassembled rotor should always be checked for concentricity and true running before being inserted into a pump casing.

Packing Troubles

Stuffing box packing troubles fall into that category of difficulties which most frequently beset a centrifugal

pump. Some of the factors in the condition and operation of a pump which may contribute to stuffing box difficulties are listed:

1. Shaft running off center, due to excessive wear in the bearing, caused by a bent shaft or to misalignment. This condition can be readily checked (1) by disconnecting the coupling and rechecking the alignment and (2) by mounting an indicator on the pump casing in the vicinity of the stuffing box and determining whether the shaft revolves concentrically.
2. Shaft or shaft sleeves worn and scored at the packing. A routine examination of these parts will determine when they must be renewed or repaired.
3. Shaft vibration due to unbalance of the rotor, to cavitation, to operation at extremely light flows or beyond the recommended maximum capacity, or to unstability in parallel operation.
4. Plugging up of the water seal connection or improper location of the seal, so that no sealing liquid is allowed to enter the stuffing box. Likewise, the presence of dirt or grit in the sealing liquid will cause stuffing box difficulties through scoring the shaft or shaft sleeves.
5. Excessive tightening of the gland with resulting absence of leakage to lubricate the packing. Hourly and daily observation of the pump operation, coupled with the knowledge that some leakage is necessary for proper stuffing box operation will avoid troubles from this cause.
6. Failure to provide suitable cooling through water-cooled stuffing boxes if the pump is so fitted.
7. Excessive clearance between the bottom of the stuffing box and the shaft or shaft sleeve, causing the packing to be gradually pushed into the pump interior. Such a condition can arise from repairs made to shaft or shaft sleeves by grinding them down excessively instead of replacing them or building them up to original dimensions.
8. Packing not properly selected for pressure, temperature or rubbing speed conditions.
9. Packing not properly inserted into the stuffing box, as for instance if the individual rings are too short and the gap between ring ends is excessive or if the ring joints are not staggered.

Bearing Troubles

Bearing trouble are probably as frequent in their incidence in centrifugal pump installations as packing and shaft sleeve difficulties. The list of contributory causes is a relatively lengthy one and should be thoroughly analyzed if bearing replacement becomes a repetitive process. The important ones follow:

1. Excessive radial or thrust load caused by some mechanical failure inside the pump or by failure of a hydraulic thrust balancing device, if such is used.
2. Excessive amount of grease or oil in the housing of an anti-friction bearing will cause overheating and failure of the bearing.
3. Excessive heating of the bearing may be due to improper dissipation of heat or to a failure of the cooling medium supply.
4. Lack of lubrication.
5. Dirt or foreign matter in the lubricant.
6. Improper installation of anti-friction bearings (damage during assembly, incorrect assembly of stacked bearings, use of unmatched bearings as pairs).
7. Rusting of anti-friction bearings due to water getting into the bearing housing.
8. Excessive cooling of water-cooled bearings resulting in condensation of atmospheric moisture in the bearing housing.
9. Last, but by far not the least, misalignment of the unit, bent shaft or severe vibration, imposing excessive loads on the bearings.

It should be noted that most anti-friction bearing manufacturers issue excellent treatises on their equipment, wherein the subject of bearing failures is covered very thoroughly. They provide photographic descriptions of the various types of failures which may occur, so that the user can analyze his own specific problem and diagnose his troubles by visual comparison. Because anti-friction bearings are used widely in centrifugal pumps as well as in other equipment, it is recommended that the maintenance personnel have such literature available and become familiar with the various symptoms of anti-friction bearing failure.

Corrosion, Erosion and Similar Troubles

One of the most insidious and most costly of the troubles which may affect centrifugal pumps is the failure of the materials used in the construction of the pump to withstand the corrosive or erosive properties of the liquids handled. Unfortunately, this problem is of an extremely involved nature and cannot be treated extensively in a series of this character. A certain amount of general information on this subject was presented in an article by the authors which appeared in the June, 1955 issue of AIR CONDITIONING, HEATING AND VENTILATING. For more detailed information, it is suggested that the reader consult the very extensive literature available on the subject of corrosion. It should be noted, in passing, that the present trend of thought in material selection has been that it is more excusable to err on the conservative side and to select materials more resistant to corrosion and erosion than may be necessary, than to invite expensive breakdowns and interruption of service through skimping on the materials selection in order to reduce initial installation costs.

Articles of Series

Here is a list of the various articles of this series, which started July, 1958, and the dates that they were published in AIR CONDITIONING, HEATING AND VENTILATING.

Installation of Centrifugal Pumps, Part 1, July, 1958
Installation of Centrifugal Pumps, Part 2, August, 1958
Operation of Centrifugal Pumps, Part 1, September 1958
Operation of Centrifugal Pumps, October, 1958
Maintenance of Centrifugal Pumps, Part 1, November, 1958
Maintenance of Centrifugal Pumps, Part 2, December, 1958
Maintenance of Centrifugal Pumps, Part 3, January, 1959
Centrifugal Pump Troubles, Part 1, February, 1959
Centrifugal Pump Troubles, Part 2, March, 1959

LOUIS BLENDERMANN ON

PIPING AND PLUMBING

Ground Water Conditions

OUT of necessity, buildings are often erected on sites or areas that are not the most favorable with regard to topography, natural drainage and soil or ground water conditions. Frequently the location of the site is more important than the particular characteristics of the site itself.

Sites with poor topography can be filled and graded, and those with poor soil or faulty drainage can be corrected. However, ground water conditions are factors that require careful handling to insure against seepage through or damage to the floor slab at grade. Ground water is generally caused by underground streams or a fluctuating water table and, unless it is controlled, the water can create endless difficulties.

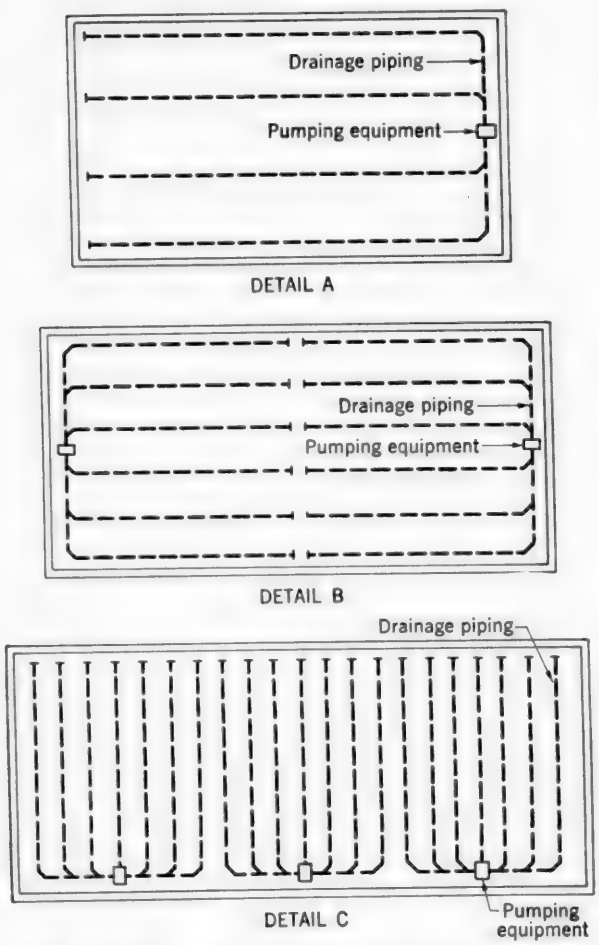


Fig. 1. Three arrangements of drainage piping.

Industrial Plant

For example, let us assume that a manufacturer decides to locate his plant in an area where ground water conditions are known to exist. Let us further assume that the plant will be of the light industrial type where all his equipment and office facilities will be located at grade level in a one story building. It is, therefore, imperative that water does not seep through the concrete slab for it can damage equipment and facilities and can cause a constant moisture problem at this floor level.

In this situation, it is first necessary to determine just how high the water table will rise and the quantity of water that will flow through the soil strata. These conditions are generally determined by the landscape architect or the site engineer. However, it is usually the structural engineer who will determine the exact nature of the condition since this data is important in the design of adequate footings and foundations for the structure.

Once the data have been compiled, the proper means for controlling the water must be established. There are many methods that may be used in protecting the floor slab. The method that will be used should be discussed with the structural engineer or the engineer who designs the foundation.

One method that will keep the floor dry is the application of a waterproofing cement finish to the floor slab. This will do an adequate job in many instances but sometimes is not too practical where heavy equipment is used and where there is danger of dropping heavy objects on the waterproofing finish. If the finish is cracked, water will seep through.

Other methods include adding waterproofing agents to the concrete mix used for pouring the floor slab. While this has considerable merit in many cases, it also has its limitations. The structural or foundation engineer must decide if this method is to be used.

Another method involves the use of an underground system of piping that will intercept the rising water and conduct it to a sand trap and sump pump where it can be discharged into the appropriate system of piping that will carry it to the outside street sewage facilities. It is this system that will be discussed in this article.

Underground Piping Systems

Dependent upon the size of the building and the quantity of ground water that must be handled, there are many piping systems that may be utilized to fulfill the need. Several systems are shown in Fig. 1.

Detail *A* of Fig. 1, shows the type of system that might be used in a moderately sized building where the piping

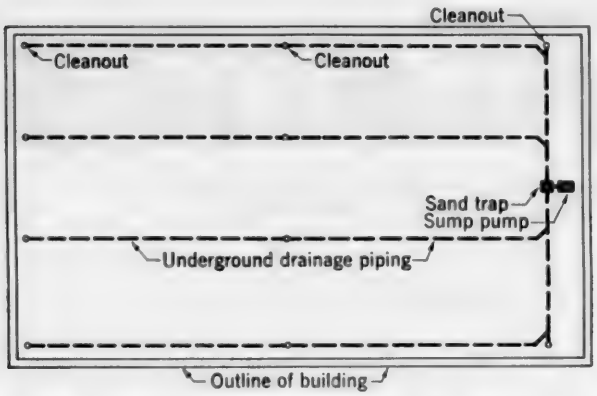


Fig. 2. One arrangement of underground drainage piping to intercept ground water under a building.

runs are not too long. The pumping equipment is placed at one end of the building.

Detail *B* illustrates the type system that might be used in a larger building. The piping system has been split to shorten the length of run; pumping equipment has been placed at each end of the building.

Detail *C* shows a still larger building and the manner in which the drainage system has been arranged to keep piping runs short. This particular system uses three separate pumping units.

These systems have been illustrated in schematic fashion examples to indicate how the piping might be arranged. The engineer can follow any specific arrangement of piping that he might favor. The quantity of water to be handled determines the lineal feet of piping that must be installed to do an adequate job.

Detail "A"

This article will discuss the underground system shown in Detail *A*. An enlarged layout of this system is shown in Fig. 2.

The drainage piping consists of semi perforated clay piping installed in a bed of crushed stone. Other types of clay pipe can also be used. Moreover, concrete or bituminized fiber pipe of the same type can be used with equal success. It is always good practice to check with the manufacturer of the specific material proposed for use, to gain the recommendations and installation procedures that the manufacturer can offer. This help will prove valuable.

As the ground water rises, it will follow the easiest path of flow which is through the piping system. Here it is conducted to the sand trap and thence to the sump pit. The sand trap intercepts and retains sand and grit for periodic cleaning, and the water overflows into the sump pit where the pump discharges it to the street sewer facilities.

Cleanouts are provided at the end of the lines and at the halfway points in the lines as shown. The cleanouts serve as access for running a wire through the line to clear sand or grit deposits or for determining the location of possible breaks in the line. Even though neither of these conditions should never occur, the cleanouts are a means for checking. They can be used to check if water is flowing through the piping. Venting will be discussed a little later.

The piping arrangement shown in Fig. 2, is for example only. A project may require more lineal feet of piping or a different arrangement of lines. The engineer must provide the system that best serves the needs of the project.

Cross Section of Piping

Figure 3 shows a section through the underground drainage piping. Here the piping rests on a bed of crushed stone and is, in fact, covered with crushed stone right up to the underside of the floor slab. The crushed stone offers a firm bed of support for the piping and, in addition, provides an easy path for the water to find its way to the piping. If the ground is very unstable, then some consideration must be given to the use of piling or other special devices to prevent the installed piping from sagging.

It is assumed that the footings or foundation of the building is supported on piling that is extended down to solid earth. The piling has not been shown in the detail given in Fig. 3. Waterproofing has been added to the exterior of the foundation. It is often desirable to coat the interior wall. This practice helps to keep the wall dry above the floor slab.

The alternate method offered in Fig. 3, indicates another way of installing the underground drainage piping. Here, trenches have been dug and filled with crushed stone. Once again, the decision of just which method is most suitable, is up to the engineer.

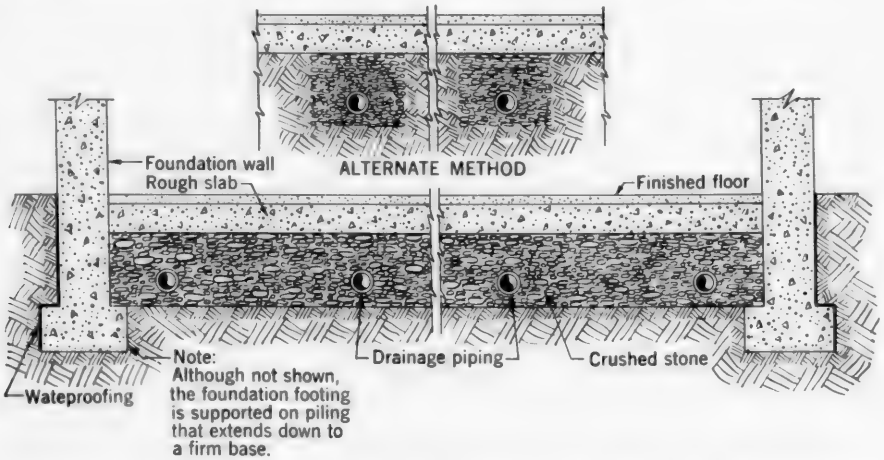
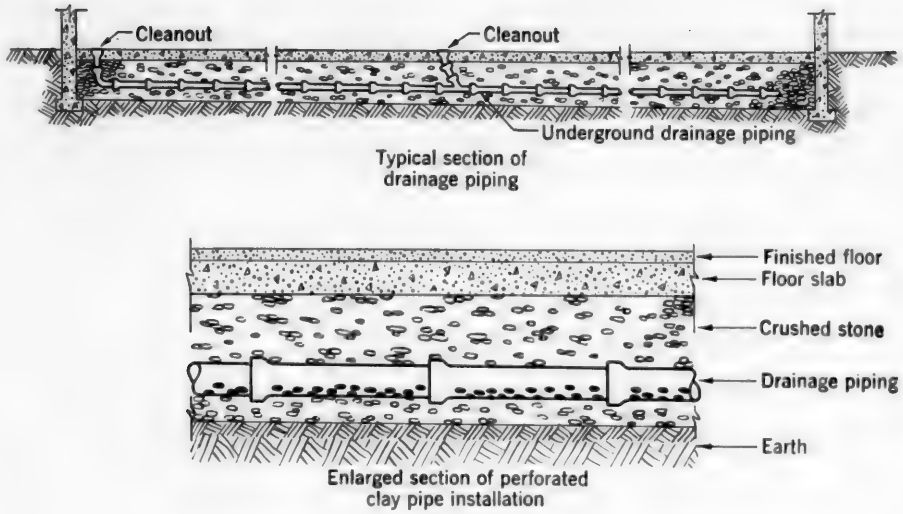


Fig. 3. How drainage piping is arranged under a floor slab, and the use of crushed stone.

Fig. 4. A typical arrangement of drainage piping.



Arrangement Of Piping

Underground drainage piping is installed to slope toward the sand trap, as shown in Fig. 4.

The slope is gradual but positive to ensure that the water will flow in the direction of the sand trap. The elevation of Fig. 4 shows the location of the cleanouts. The enlarged detail of the piping shows that the perforations are located at the bottom of the piping to intercept the rising ground water. As mentioned earlier, sufficient lineal feet of piping must be used to take care of the amount of water that can be expected.

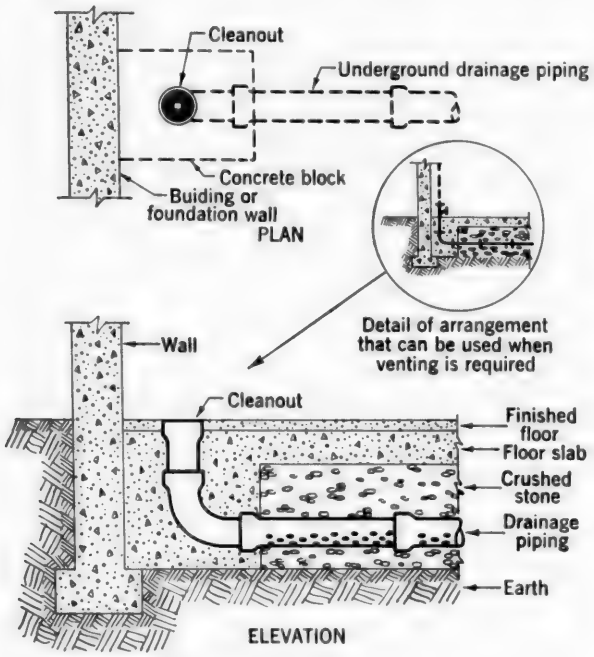


Fig. 5. End-of-line cleanout and how it is anchored.

Arrangement of End Cleanouts

Cleanouts at pipe ends must be securely anchored in place as suggested in Fig. 5. To accomplish this it is necessary to completely surround the cleanout with a block of concrete poured at the same time as the floor slab. A cleanout plug at floor level permits access to the underground piping. If venting is desired for the underground piping, it can be accomplished in manner shown in the small detail of Fig. 5.

In-Line Cleanouts

The in-line cleanout, Fig. 6, is generally constructed in a manner similar to that given for the end-of-line cleanout.

A block of concrete is poured to surround the cleanout and is poured at the same time as the floor slab. The cleanout tee and bends are solid pieces of clay pipe. Where the perforated piping is contained in the block of concrete, tar paper is wrapped around the end of the piping to prevent the concrete from entering the perforations.

Combination Sand Trap and Sump Pump

Figure 7 shows a typical arrangement of sand trap and sump pump. One structure is erected to accommodate both functions. The bottom of the sand trap is sloped to simplify cleaning. There is always an amount of sand or crushed stone grit that will find its way into the drainage line. This material is usually washed into the sand

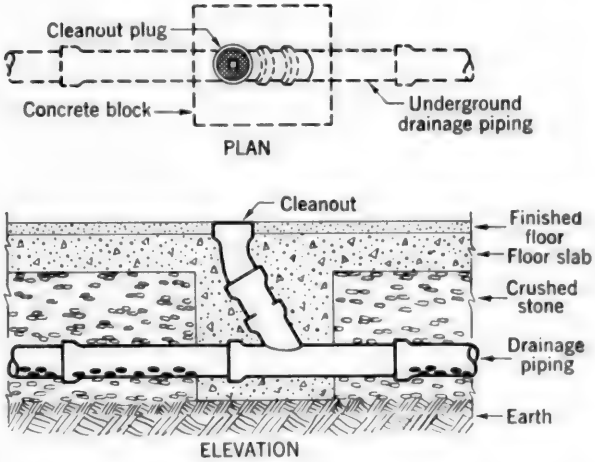


Fig. 6. Installation of in-line cleanout and the manner in which it is anchored in place.

trap by the ground water. The sand trap prevents this material from reaching the pumping equipment where it could do some extent of damage.

The physical dimensions of the sand trap must be determined by the engineer. The depth of the sand trap is usually 18 to 24 inches or any other depth that may be favored. The entry of the underground piping should be set above the water level in the sand trap. A steel cover is placed over the pit opening to offer easy access to the pit.

The sump pump is the duplex type and must be of a size that will adequately handle the peak flow of the ground water. The sump pit depth must be sufficient for proper installation of pumping equipment. The pump manufacturer should be consulted regarding the proposed installation since he can usually offer much helpful data upon request.

The interior of both the sand trap and the sump pit is surfaced with waterproofing material to maintain watertight conditions in both units.

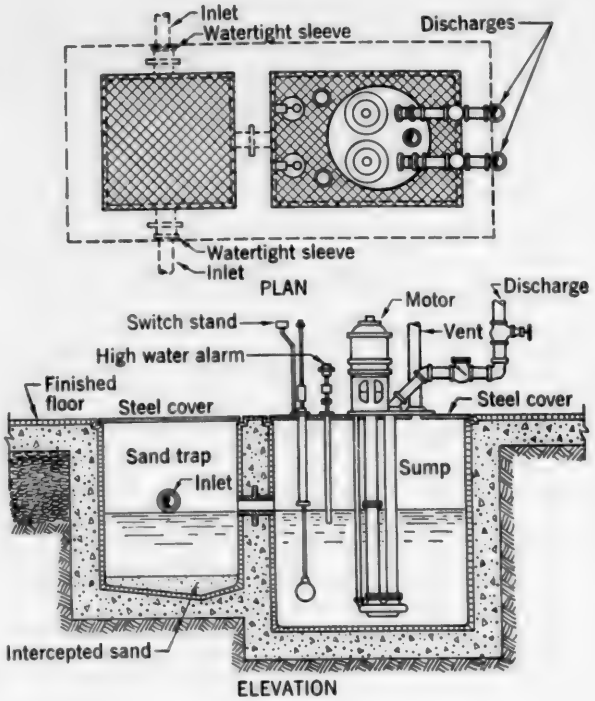


Fig. 7 (right). Arrangement of sand trap and sump pump to handle the discharge of ground water.

Army Develops Wind Chill Table

A Wind Chill Table, designed to gage in advance the severity of the weather, will be provided to Army commanders in an effort to further reduce the already low incidence of cold injury among troops. The table was developed at the U. S. Army Medical Research Laboratory, at Fort Knox, Ky.

Wind chill, one of the most important factors in the production of cold injury, may be prevented by proper use of this table which shows equivalent temperatures, so that when a unit commander has a forecast of the temperature and wind speed, he can determine the approximate temperature equivalent against which he must protect his men.

Everyone knows it feels colder when the wind blows, but they don't know how much colder it actually is; results found in the Wind Chill Table are startling. For example, the table shows that if the temperature to be expected is about 34 deg F and the expected wind velocity is 20 mph, then the effect on exposed flesh is the same as 38 deg below zero with no wind—a condition similar to that found in a deep freeze.

To use the table, first obtain the temperature and wind velocity forecast data. Locate the expected wind speed at the top of the table. Read down this column to the number corresponding most closely to the expected temperature. From this point, follow across to the last column on the right, marked zero wind speed; this is the equivalent temperature reading.

EQUIVALENT TEMPERATURES ON EXPOSED FLESH AT VARYING WIND VELOCITY

Wind Velocity in miles per hour										
45	35	25	20	15	10	5	3	2	1	0
Temperature in deg F										
90	89.5	89	88.5	88	88.8	87.5	87	86	84.5	83
82	81	80.5	80	79.5	78	76	74	72.5	70	60
72	71	69.5	68	67	65	60	57	53.5	47.5	23
63	61	59	57	55	52	44.5	39	34.5	20	—11
51	49	47	45	42.5	38	28	18.5	11	0	—27
41	39	36	34	30.5	25	11	0	— 9	—23.5	—38
30	28	25	23	18	11	— 5	—16.5	—40	—	—
20	18	14	11	6	— 2	—19	—40	—	—	—
10	7.5	3	0	— 6	—15	—35	—	—	—	—
0	— 2.5	— 8	—12	—18	—29	—	—	—	—	—
—11	—14	—18	—23	—30	—	—	—	—	—	—
—21	—24	—30	—35	—	—	—	—	—	—	—
—32	—35	—40	—40	—	—	—	—	—	—	—

Note: Dashes indicate values below minus 40 deg F.

Explanation of the mechanism of

Thermoelectric Refrigeration

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At present, interest is developing in the field of thermoelectric refrigeration. This article was prepared to provide a better understanding of the production of cold through this principle.

THERMOELECTRICITY is, by definition, a property of two different materials joined together and subjected to a temperature difference. When two such materials are placed in electrical and thermal contact the distribution of electrons in them will differ. Figure 1 illustrates this and shows on the left the distribution of electrons in an ideal material at a uniform temperature. The electrons are everywhere equally populous. But as

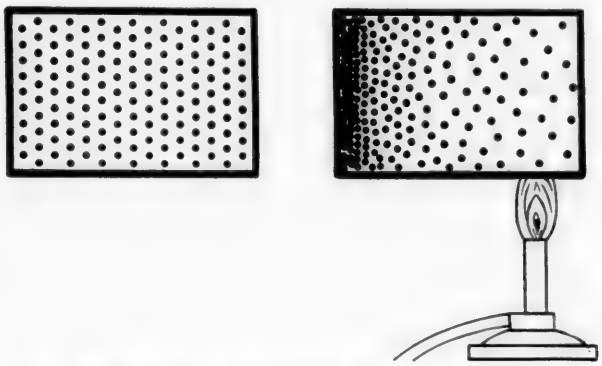


Fig. 1. Distribution of electrons in an ideal material. Left, unheated; right, heated at one end.

heat is applied to one portion of the material so that a temperature difference exists between that portion and some cooler places further out on the bar, then the electrons will tend to leave the warmer portion and concentrate near the cooler portion. The net effect, as shown on Fig. 2, is an electrical polarization of the material, namely, a difference in electrical charge. The region on the colder side having more electrons will be more negative than the warmed side. However, once this condition is obtained, no further effects are noted since there is no closed circuit through which the electrons may flow back to the warm side, and hence as can be seen, no work can be done.

Shift of Electrons

As shown in Fig. 3, if we connect two materials of different character, and the difference may be slight or extreme, we observe that they will then distribute their electrons under the influence of heat in such a way that the net result will be a flow of electrons if the circuit is closed by means of a wire. This process is not unlike the expansion of and compression of a gas, so that frequently one hears reference to an electron gas as a convenient way of thinking not only of this but also other electronic processes.

Reversible Process

Now, thermoelectricity is what is called a reversible phenomenon. This means that, if heat may be used to pump electrons, then electrons may be used to pump heat because each electron carries with it a certain fraction of the heat contained in the entire material. As it moves from the warmer to the cooler portion, it carries with it a quantity of heat as well as its unit of charge. If this is the case, one should be able to impose, as is shown in Fig. 4, an electric current by means of a battery and cause the electrons to move in the direction such that heat is pumped. The electrons carrying heat from one place to another will result in a cooling effect as they expand across the junction between the two different materials and heat that they carry is ultimately delivered to the opposite ends of the materials.

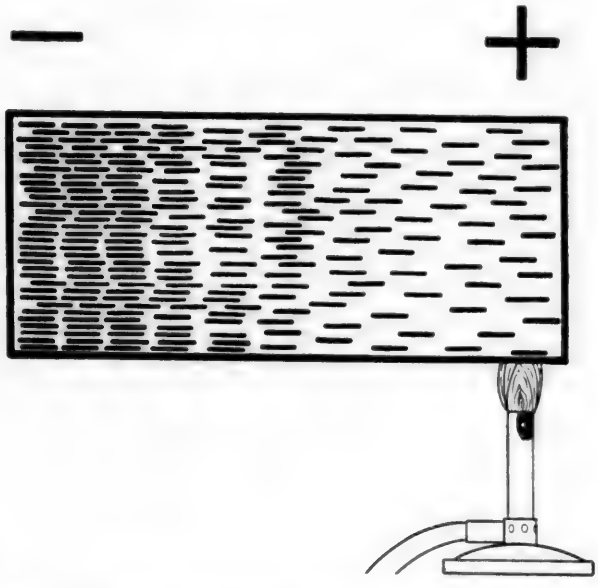


Fig. 2. Electrical polarization of a material due to unsymmetrical heating.

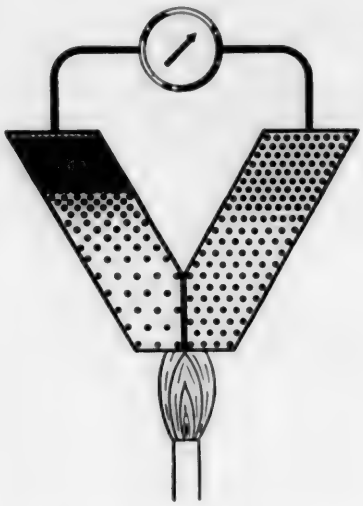


Fig. 3. Single junction generator — electrons distributed under influence of heat so that net result is flow of electrons if circuit is closed.

Therefore, thermoelectric power is defined as electrons pumped by heat—*and thermoelectric refrigeration —heat pumped by electrons.*

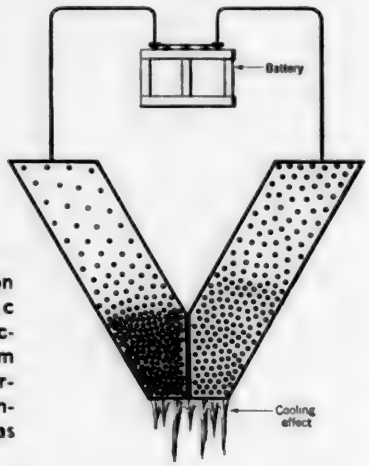


Fig. 4. Single junction refrigerator. Electric current causes electrons to move from warmer to cooler portion, carrying a quantity of heat as well as its unit of charge.

Properties of Material

With these basic principles established, we can proceed to a discussion of the applications that thermoelectric refrigeration will perform. In Fig. 5 are plotted the physical parameters which govern the thermoelectric properties of materials. It may be seen here that there are three classes of matter which exhibit thermoelectric properties to some extent: *metals*, which have a sufficient number of electrons to be very good electrical conductors; *semiconductors*, where the number of electrons is intentionally restricted to give the desired characteristics of that class of materials; and *insulators*, where there are so few electrons that the electrical conduction is poor. In marked contrast to the deficiency of electrons, the insulators have the highest thermoelectric voltage, definitely a desirable characteristics for power generation.

Explanation of Graph

In this figure the letters on the ordinate represent: M, merit factor; T, maximum operating temperature; S, Seebeck coefficient.

It is clear from examining the data plotted in Fig. 5, that the most attractive materials for refigeration are those in the general class of semiconductors and, in fact, this has been demonstrated many times in the past, beginning in 1838 when the Peltier effect was demonstrated by a Russian academician named Lenz using a couple probably composed of compounds of bismuth. The present research work is largely concerned with materials based upon the formula $Bi_2 Te_3$ (bismuth telluride) which suitably prepared, can demonstrate a heat pumping efficiency of the order of 18 to 20%. However, for many reasons such as mechanical properties and cost of raw materials, it is desirable to deviate from this composition and a number of proprietary compositions are now available which have properties comparable with bismuth telluride.

Thermal Efficiency

We will confine the remainder of our discussion to the recent advances in the engineering and fabrication of devices to use the thermoelectric principle. In Fig. 6, overall efficiency (sometimes called the thermal efficiency of a variety of heat engines) is plotted as a function of the power rating of these engines. Observe that the curve defines an area such that any machine that is desired can be designed underneath the curve to the right and that for low power ratings, low efficiences are apparently inevitable. This curve was drawn for the reverse of thermoelectric cooling, which is the field of thermoelectric power generation.

However, it is interesting to observe that this same curve is applicable to refrigeration as well as to power generation. We simply change the x-axis from power rating to tons of cooling. Now it is seen that a very small compressor must be a very inefficient compressor and a very large compressor may be quite efficient. It is obvious too that there are more things that one wishes to do in the small range of refrigeration, more units are desirable which enclose only a cool volume of a few cubic inches to a cubic foot or so, than would be the equivalent case for a few watts of power in power generation. It is also true that the efficiency of thermoelectric refrigeration materials is now a considerable way along the road toward com-

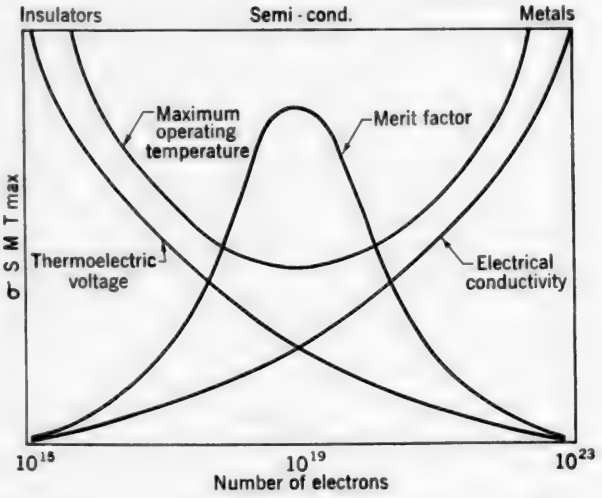


Fig. 5. Thermoelectric parameters — metals, semiconductors, and insulators.

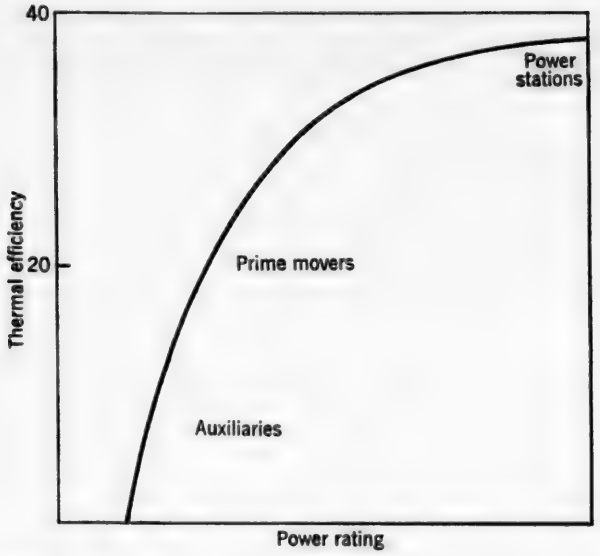


Fig. 6. Graph of conventional and thermoelectric power vs. efficiency.

peting with existing devices. Admittedly the efficiency is only about half what you might get for existing devices in the rather heavy ratings, it is nevertheless true that for very small refrigeration devices, no compressors exist today that are at all reasonable in either (1) efficiency or (2) size.

Coefficient of Performance

The coefficient of performance is defined as the heat being pumped divided by the power necessary to pump it. This may be related to the properties of material by the expression:

$$\text{C.O.P.} = \frac{1}{2}\left(\frac{\triangle T_{adia.}}{\triangle T} - 1\right)$$

$$\triangle T_{adia.} = 2M_w T_{cold}$$

Now the term M_w contains the electrical and thermal properties of the materials in the following way:

$$M_w = \left(\frac{T}{4}\right)\left(\frac{S^2}{\rho K}\right)$$

where T is T_{cold}

S is $\mu V/°C$

ρ is resistivity

and K is thermal conductivity.

(All T values are in °K)

Typically this expression M_w will range in value from 0 to a theoretical limit of about 0.3. At present the value is in the range of about 0.1 to better than 0.2.

The thermal design considerations associated with a thermoelectric device, whether for refrigeration or power generation, must be directly related to the development of new materials. It is necessary that heat pass through a thermoelectric material for power to be generated; or that electric current pass through it so that heat is pumped to create a condition of refrigeration. Dr. Edward V. Somers, a Section Manager of the Thermodynamic Section of the Westinghouse Research Laboratories, has guided this portion of the program.

Causes and Cures for an Unsteady Water Line in Low Pressure Steam Boilers

A fluctuating level in the water line of a steam heating boiler is usually an indication that fuel is being wasted. Therefore, by correcting this condition, a substantial amount of fuel can be conserved.

One may wonder what are some of the conditions that create this fluctuating water level.

The chief contributing factor is the presence of grease or dirt in the boiler water. Oil being lighter than water, floats on top. Steam, rising toward the surface, cannot penetrate that part of the surface covered by oil and it condenses without leaving the boiler. The surging effect thus created is reflected in the rising and falling of the water line level in the gage glass. This condition is more likely to exist in new systems, since plumbers and steamfitters must use oil in their threading operation. Some of the oil left on threads then enters the pipe.

To test for oil in boiler:

1. Draw off a small pan of water using the opening at the bottom of the gage glass.
2. Bring water to a boil over a gas plate.
3. If the water is clean, it will come to a full rolling boil over the entire water surface.
4. If oil is present, only part of the surface will boil and only in places where no oil is present.

The job of eliminating oil from boiler water should be done by a contractor because specialized knowledge is needed to do the work properly. A well-meaning, do-it-yourself attempt by one not experienced can result in higher fuel costs.

For example a custodian, in an effort to offset oil resistance, may raise the steam pressure in the belief that this can overcome the surface tension caused by the presence of oil. This only serves to waste fuel. Steam at four pounds pressure has little more heat than steam at two pounds and costs much more to produce.

Fluctuating water level can also be caused by poor boiler design. If the connecting links between sections of the boiler are small, and the fire is situated under only one section of the boiler, then turbulent water will tend to back up at the small fittings, rather than flow evenly throughout the system. This cannot be corrected by raising the steam pressure. Only a design change will help.

The lack of a Hartford loop or check valve in the wet return piping may also cause unsteady water level. Here again a heating contractor can remedy this situation.

Most causes of fluctuating water level can be remedied as suggested. Time and money spent in maintaining a steady water level will be quickly repaid in fuel savings.—*George Balasses, consulting engineer, Anthracite Information Bureau, New York, N. Y.*

Gas vs. Electric Air Conditioning

In the January, 1959, issue of this publication the Reference Section was devoted to a comprehensive discussion of Gas Powered Air Conditioning which was prepared by the Air Conditioning and Heating Committee of the American Gas Association. This discussion included information on the economics of gas air conditioning, and this particular phase of the section has elicited comments which follow, prepared by E. R. Ambrose, Head, Air Conditioning Division, American Electric Power Service Corporation, New York, N. Y.

The January 1959 Reference Section article on Gas Powered Air Conditioning, under economic considerations particularly, implies advantages for absorption systems which are misleading and inaccurate. Actually, it is not so much what was said in the article as what was not said that can cause the erroneous conclusions.

In Table 1 and throughout the entire article, for instance, the steam consumption of an absorption system is given as 20 pounds per ton hour. The article neglected to state that this is a full load value under a given set of conditions and that with partial loads the steam consumption can increase to as much as 31 pounds per ton hour. In fact, it has been found from actual observation of many commercial installations that the cooling system operates at full load only about 11-15% of the season while operating at 75, 50 and 25% capacity for about 30, 50 and 12%, respectively, of the cooling season. It can, therefore, be concluded that the seasonal consumption (whether it be steam or electric) must be computed on the basis of total operating hours and not equivalent full load hours. It is interesting to note in this regard that frequently the decrease in kw demand of the electric driven machine is in direct ratio to the capacity reduction which makes it very attractive for light load operation.

Another omission in the article is the kwh consumption of electric auxiliaries which are chargeable to the absorption system. Each system must have purge pump, solution pump and an evaporator pump. The size of these pumps on a 200-340 ton Carrier machine, for instance, is 2.5 and 3 hp, respectively. On a York machine, these pumps, according to the article, are ¾, 1½ and 1½, respectively. The important thing to remember is that these pumps must operate whenever the machine is being used, regardless of the load, and even on a standby basis under no load conditions. This usually means a total of 2000 to 4000 hours or more of operation per cooling season. In addition, the kwh consumption of the many other electric auxiliaries must be added to the absorption system. This includes boiler controls, steam condensate pumps, additional condenser pump consumption (over a comparable electric driven machine) and additional cooling tower fans (over a comparable electric driven machine). The electric energy cost of these auxiliaries represents a relatively large percentage of the total operating cost of an absorption system. As an example, in a recent evaluation of a 360 ton system, the estimated annual gas consumption cost of an absorption machine was $17,083 and the electric energy cost of the auxilaries was $2235 making a total of $19,318, while the comparable operating cost of an electric driven machine was $7438. The auxiliary cost of the absorption machine was not only 13% of the total operating cost of the absorption system but was equivalent to about 30% of the total cost of a comparable electric driven machine as well.

The third omission in the article was the failure to mention the need of a larger cooling tower for an absorption machine. Table 1 did list the heat rejection to the cooling tower water of 32,000 to 34,800 Btu per ton but it was not stated that in contrast only 15,000-16,000 Btu were required for an electric driven machine. This means that the cooling tower must not only be larger in size but must have larger fans and circulating pump and be heavier than a comparable size electric driven machine. Using Table 3 of the article as a guide, this would mean that the dimensions of a cooling tower for a 250 ton absorption machine at 75 deg wet bulb would be 18 x 33 x 8 feet with a weight of 54,800 lb and having two 7½ hp fans. In contrast, the dimensions of a cooling tower for a 250-ton electric driven machine at 75 deg wet bulb would be 18 x 17 x 8 feet with a weight of 28,500 lb and having one 7½ hp fan.

Another misrepresentation in the article is the use of 75 to 80% boiler efficiency to obtain the seasonal fuel consumption. These are so-called "boiler test" efficiencies obtained under ideal conditions. For instance, such an efficiency is obtained by operating the boiler, which is clean on both the fire and water sides, at a constant predetermined load (usually at its rated capacity) for several hours prior to taking any readings. During this warm-up period, the air-fuel ratio is adjusted to give maximum efficiency. Such a test, however, does not simulate actual operating conditions throughout the season, since such influencing factors as flue pipe losses, standby losses and faulty operation of the boiler are excluded. Consequently, the actual seasonal boiler and auxiliary equipment efficiency will be much lower than the 75 and 80% ideal efficiencies.

A rebuttal to Mr. Ambrose's article has been made by Robert H. Combs, Chairman, Air Conditioning and Heating Committee, American Gas Association, as follows:

Mr. Ambrose has properly pointed out that when a cost analysis is made, its main purpose is to determine what type of equipment will have the lowest ownership and operating cost in the long run. The costs of the origi-

nal equipment and the costs of operation must be accurately estimated. These estimates must, per force, include all relevant data.

His comments dealt exclusively with a comparison of electric and absorption systems, disregarding the other systems treated in the Reference Section, namely steam turbine driven and gas engine driven equipment. Both these types are widely used. We should not overlook the fact that, in many situations, these types of equipment enjoy a favorable economic position. It would be equally incomplete to compare selected types of equipment as it would be to compare only selected economic factors in making an analysis.

According to the ASHRAE definition, "air conditioning" includes winter as well as summer operation.

The case is made for summer air conditioning, but winter air conditioning has been almost completely ignored. We believe that the true costs of comfort within a building, whether it be an industrial or a commercial establishment or an office building, are made up of the cost of both winter and summer air conditioning. Therefore, the following factors should be analyzed:

1. Winter air conditioning (heating) owning and operating costs inclusive of all special features and equipment.
2. Summer air conditioning owning and operating costs, including the cost of all special features and equipment.
3. The hitherto neglected owning and operating costs of the building hot water supply which is a year-round requirement.

The winter air conditioning costs and the summer air conditioning costs are relatively straightforward estimating and calculating procedures. The third point may often tip the scales in view of the fact that almost every building has a hot water boiler which runs all year round. In the winter, it supplies heating and building hot water; in the summer, it supplies building hot water alone. During the summer, when it is operating at very low loads, its efficiency is quite low. The boiler is used during the summer for additional load which operates air conditioning equipment. This yields a dual benefit. It will bring the over-all yearly efficiency of the boiler to a higher level and lower the average gas rate. It was pointed out that auxiliary equipment operating costs can amount to a sizeable figure. In many areas, consideration of additional operating costs of electric auxiliary equipment is completely overshadowed by low gas rates.

There always exists a particular combination of equipment which will yield the lowest operating and ownership costs. We must not overlook the operational advantages of year-round systems. Consistent optimum comfort, as well as low cost, should be the yardstick of choice. No compensatory factors should be conjured up. We sincerely believe that gas equipment will be found to satisfy most of the requirements, most of the time.

New Data on Infra-Red Heating

Experience with recent infra-red heating installations in Germany[1] has demonstrated that standard heat-loss estimates tend to produce oversized installations. Unlike other heating methods, capacity does not increase with room height or volume, and is less affected by loss through building walls.

Mounting of infra-red heaters around the whole cornice of the room, rather than below the ceiling, is recommended, to reduce convective losses. As room height increases, infra-red heating becomes a more economical method, as compared to convective heating. For rooms with breadth less than about three times the height, the value of specific radiation output (total load divided by floor area) is a constant, its value being dependent only on the temperature difference, inside and outside, and the room structure. In calculating heat loss, a lower room air temperature is allowable. A temperature of 57, rather than 68 deg F, may be used.

[1] Calculations for Electric Infra-Red Space Heating; F. Fourne; *Heizing, Lettung, Haustechnik*, January, 1958, as summarized in *Heating*, (London) December, 1958.

Infra-red heating is especially suitable for short-period heating. When turned on, equivalent temperature rises rapidly with radiator temperature, while air temperature rises more slowly, due to heat given off by persons and irradiated objects. As air temperature rises, radiation output may be reduced to maintain a constant comfort temperature.

A minimum loading of 10 watts per sq ft for an outdoor temperature of 32 deg is recommended for rooms with one external wall and normal doors and windows, but this necessitates a preheating time of 10 to 20 hr. To reduce this to more reasonable values of 1 hr or less, additions to the installed capacity are proposed as given in Table 1.

In offices, it is desirable to place additional heaters beneath each desk, to irradiate legs and feet. Capacities of 150-250 watts are recommended. The installed capacity may require further adjustment to take care of large windows or severe exposure, better insulation, etc.

When only part of a room requires heating, the capacity is worked out on the basis of the heated floor area, and additions made to allow for heat escaping to the rest of the room as given in Table 2.

TABLE 1—ADDITIONS TO INSTALLED CAPACITY

Room	Preheating, Min.	Additions, per cent
Bedroom, Bathroom	2-4	80
Living Rooms	2-7	50-70
Offices	7-12	35
Schools	5-10	60
Workrooms	15-60	30-40
Churches, Exhib. Halls	30-90	30-35

TABLE 2—ADDITIONAL HEATING CAPACITY FOR PARTLY OCCUPIED ROOMS

Fraction of room to be heated, per cent	60	40	25
Addition (referred to heated area, per cent)	20	35	50

NEWS OF EQUIPMENT AND MATERIALS

Use the convenient prepaid postcard appearing on the last page for securing additional information about new equipment and materials described in this department.

Small Heat Pump

A 2-hp heat pump designed for small homes and multi-unit structures is introduced by Carrier Corp., Syracuse, N. Y. Called the Heat Pump Weathermaker, it is more compact than previous models, and is the first one-piece unit produced by the company for whole-house air conditioning. Its cabinet is less than 3 ft square and can be located outside the house for simple installation and service. According to a company spokesman, the new heat pump represents substantial savings in initial and operating costs over other methods of year-round air conditioning.

Cooling capacity is 22,000 Btu and heating output is 23,000 Btu, with additional strip heaters available at 10,000 Btu each. Automatic defrosting is actuated every 90 min, if necessary. The operation starts only if the outdoor temperature is in the range where frost will form. This is the same device used on the company's larger heat pump systems.

Separate fan motors are said to increase efficiency by permitting constant recirculation of inside air without operation of the outside fan. Defrost is accomplished in 5 min because no cold air is drawn into the unit while the outside fan is in operation.

Besides a room thermostat which automatically switches the unit from heating to cooling as required, the heat pump has an Econostat located outside to actuate strip heaters when temperatures fall below certain levels.

More information? Circle Item 1, postcard, last page.

Refrigeration Compressor Line

Worthington Corp., Harrison, N. J., announces its new integrated refrigeration compressor line of hermetic and direct coupled drive units in six sizes ranging from 15 to 80 tons. General design, exceptionally close-running fit tolerances, rugged cast iron body and manifold, and the use of cushioned ring valves all help to assure unusually quiet operation.

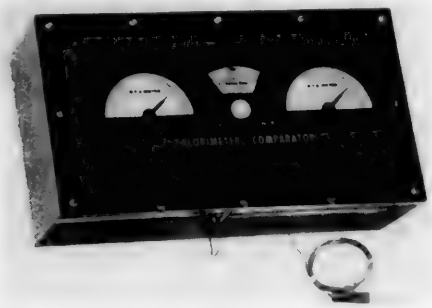
Compressor is designed to operate at 1750 rpm in direct coupled or hermetic arrangement. Overall reduction in size and weight to displacement is realized at this speed. Major cost reduction results from using 4-pole direct-connected motors, thus eliminating the necessity of V-belts and sheaves.

Each feature has been engineered and tested to insure the most trouble-free performance possible. Interchangeability of components between the field serviceable hermetic compressor and the coupled compressor reduce to a minimum the local inventory required to render replacement of all components subject to wear.

More information? Circle Item 2, postcard, last page.

Test Cooling Capacity

A newly invented portable instrument, announced by Liaison Engineering Services, Garland, Tex., is named Calorimeter-Comparator and is said to test the effectiveness of residential, automotive, and commercial air conditioners. According to the company, it accurately indicates the Btu's removed by the air conditioner in operation, as well as total air volume, in the conditioner's installed operating condition.



Overall dimensions are 16½ by 9 by 6½ inches. It weighs about 6 lb, and is self contained. A complete test requires only a few minutes, the company states, and the technique is said to be quickly and easily mastered by any mechanic. Operators using it are quoted as saying that this new method is more accurate and faster in balancing out central air conditioners and is the only way to test window units for Btu-per-hr capacity. After the test, the company suggests, the owner is given an official signed certificate certifying the unit's capacity in its installed condition.

More information? Circle Item 3, postcard, last page.

Magnetic Line Contactor

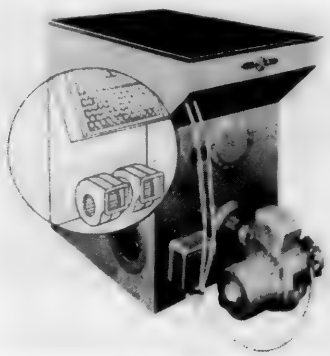
A magnetic line contactor for central residential air conditioning systems is introduced by Appliance Control Dept., General Electric Co., Schenectady, N. Y. Designated 3ARR-8, the contactor can be mounted in any position for applications such as starting and stopping compressor and fan motors and auxiliary heating circuits on air conditioning systems.

More information? Circle Item 4, postcard, last page.

Floor Furnace Has Air Filter

What is reported to be the industry's first floor furnace with an air filter is announced by General Automatic Products Corp., Baltimore, Md.

The unit has a gun-type burner, oil-fired, with 85,000 Btu per hr output. Large twin-turbine blowers facilitate

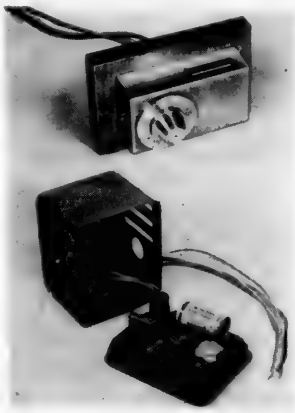


use of the standard 16 x 20 x 1-inch filter. Return air is filtered and recirculated. The filter is easily removable from the top for cleaning or replacing. A return air opening is provided for return duct where use of the latter is desired.

More information? Circle Item 5, postcard, last page.

Electronic Furnace Modulation

Forced air gas furnaces for home heating now can produce continuous, non-cyclic heat with electronic modulation; the burner flame actually changes to counter-balance the heat loss in the home. Modulator system is called the Selectra System by its manufacturer, Maxitrol Co., Detroit, Mich. System features a wall temperature control (at top in photo) that may be set by the homeowner from 55 to 85 deg F.



Forced air heating systems have always been identified with full on-off burner operation and intermittent blasts of air, which result in cyclic temperatures and physical discomfort, according to the company. With Maxitrol electronic modulation, the burner continually adjusts to compensate for the heat loss in the home; the air is in continuous motion, although at a slower speed. Continuous circulation of warm air wipes the cold floors and outside walls. It removes pockets of warm air from the ceilings, and does much to overcome that "cold 70" or "hard to heat" room. This continually moving air is being conditioned by the furnace filters and humidifier.

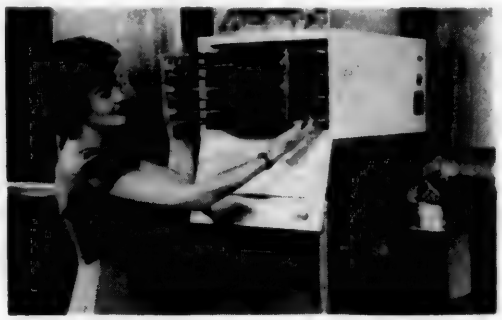
Temperature sensing is achieved by a thermistor the size and shape of an automobile fuse. The thermistor senses the need of heat and controls a current which is amplified by a transistorized circuit (at bottom in photo) and used to operate the solenoid power head of the modulator valve. The solenoid positions a plunger which controls or modulates the burner flame to balance the heat loss in the home. The modulator valve has the dual function of modulation and pressure regulation and replaces the gas regulator on the furnace manifold.

More information? Circle Item 6, postcard, last page.

Three-Stage Air Cleaner

Electronic Div., Mamco Corp., Racine, Wis., announces a new line of electronic air cleaners.

The line, designated Health-Air, incorporates a 3-stage filtering system to purify air. The first stage mechanical element eliminates large airborne particles plus va-



rious germs, bacteria, pollen, mold spores and mildew; the second stage electrostatic filter eliminates dust and other particles down to .01 microns; the third stage element of activated charcoal removes all remaining gases, smoke and odors.

An eight-page catalog, describing the unit in detail, has been produced and is available to those interested in air purification.

More information? Circle Item 7, postcard, last page.

High-Capacity Submergible Pump

A submergible pump that is rated at 130 gpm, but has a capacity range up to 225 gpm, is announced by Red Jacket Manufacturing Co., Davenport, Iowa. The pump, designated Model H "Submerga," is designed for 6-inch wells and will pump from depth to 600 ft. Many users have developed a preference for this type of pump, the company states, because it requires less maintenance and, in many cass, can be installed at a lower initial investment.

The pump is available with five motor sizes, 5, 7½, 10, 15 and 20 hp, and with 3, 4, 5, 8, and 10 stages to meet a wide range of pumping requirements. The 5 and 7½-hp pumps are available with single-phase motors for 230-volt electricity, and all sizes are available with 3-phase motors for either 220, 440, or 550-volt electrical circuits. Pump performance curves and complete information are available from the company.

More information? Circle Item 8, postcard, last page.

Quick-Installing Insulation

Sta-Dry is the name of a new Foamglas rigid cellular glass insulation for hot and cold commercial piping applications offered by Pittsburgh Corning Corp., Pittsburgh, Pa. According to the manufacturer, new production equipment allows the company to price the material at approximately the same cost per linear foot as other commercial pipe insulations.

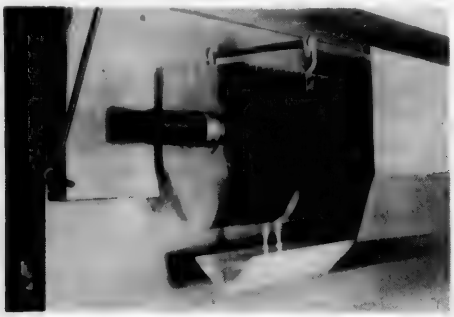
For ½- to 6-inch piping in a temperature range from 35 to 350 deg F, the insulation is said to result in a permanently vapor-proof incombustible, waterproof, dimensionally stable installation. It is shipped in 24-inch lengths, factory-wrapped with a dual-purpose kraft and aluminum foil laminate. The white laminate serves as a protective jacket and has a finished appearance. It can be painted with a water-based paint if desired.

Due to its high compressive strength, the company states, the covering can be installed before or after hanging the pipe. Hangars can go around a fully insulated pipe section without compressing the insulation.

More information? Circle Item 28, postcard, last page.

Valance Heating-Cooling

Commercial availability of valance heating and cooling system components is announced by Penn Boiler and Burner Mfg. Corp., Newark, N. J. Called Val-Ray, the system was developed, tested, and perfected by the John



B. Pierce Foundation, New Haven, Conn. It is a hydronic system consisting of conventional extended fin surface supported by brackets and mounted high on the wall, covered by a valance placed close to the ceiling.

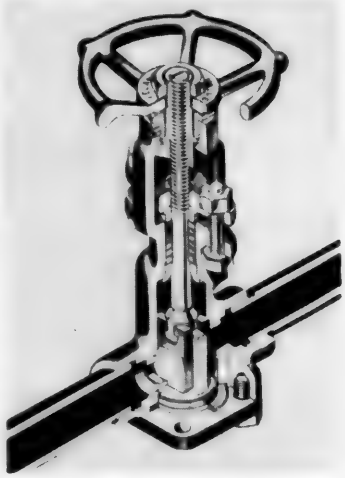
Advantages of the system, which can be installed for heating only or for year-round use, according to the company, are that it is noiseless, draft-free, allows complete decorating freedom, saves space, installs simply, and lasts a lifetime. A thin stratification of high temperature air at ceiling level transforms the ceiling into a radiant panel. Incorporation of a water chiller and polystyrene condensate troughs into the system provides a convective cooling system for warm weather.

Design procedures differ little from standard methods. Cooling loads are calculated in accordance with ASHRAE or I-B-R Guides. Heating loads are calculated in the same manner as any other system except that a 30-deg F higher temperature difference must be used for all exposed ceilings. Heating output is based on 450 Btu per lineal foot, cooling on 200 Btu per lineal foot of radiation.

More information? Circle Item 29, postcard, last page.

Gate Valve is Bonnetless

Introduction of a forged steel gate valve, in sizes to 2 inches, which permits complete and fast servicing and testing in the line, is announced by Velan Valve Corp., Plattsburg, N. Y. According to the manufacturer, the one-piece forged steel body eliminates the body-bonnet leakage and the bottom guide cover permits the removal and replacement in the line of the wedge, stem, back seat and the two screwed-in seats in a matter of minutes. Positive wedge guiding is also accomplished with precision machined guides and wedge dragging is not possible.



More positive closing and longer life are said to be assured because during assembly both seats are air tested under water and visually controlled through the bottom cover. Testing for tightness of seats is made easy by closing the valve and by the removal of a drain plug in the bottom cover, either under full pressure or during shut-down periods by applying air pressure from a small test rig. Flushing of the valve is possible and decarbonizing within minutes, all in the line, by removal of the bottom guide cover. Addition of a petcock to the test plug opening would simplify these maintenance operations even more, the company states.

When valve is fully open, a stainless steel replaceable back seat, hardened, ground, and lapped, will provide permanent back seating and preservation of the packing rings, which consist of six high pressure, high temperature asbestos rings.

These bonnetless, forged steel gate valves are available with any trim and for 600- and 1500-psi service, as well as with bodies in carbon, alloy or stainless steel.

More information? Circle Item 30, postcard, last page.

Push Button—Pilot Light

A push button and a pilot light are combined by Allen-Bradley Co., Milwaukee, Wis., in Bulletin 800T heavy duty, illuminated oil-tight push-button units. Units are completely sealed to exclude oil and coolants and the contact blocks have double-break NO-NC contacts of silver alloy said never to require maintenance.

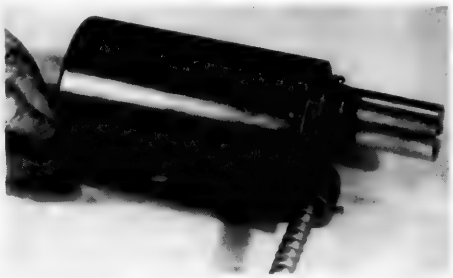
Flexible circuitry permits pilot lamp to be wired to go *on* or *off* when the button is pressed, or it can be energized from a separate source. In addition, this same unit can be wired as a push-to-test pilot light, and normal pilot light lenses are available for this type of service. A step-down transformer is built into each unit to supply the more rugged 6-volt pilot lamps.

More information? Circle Item 31, postcard, last page.

Universal Flame Detecting Unit

Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., introduces what it describes as the electronic industry's first universal detection device for use on all types of commercial and industrial heating or processing burners. Heart of the system is the company's recently-unveiled ultraviolet-sensitive tube.

The tube works with an amplifier circuit in the new self-contained Honeywell C7012A Ultra Vision Flame Detector system to add up the impulses of electrical energy generated by the tube (shown being held) as it counts



the ultraviolet rays present in all types of flame. An output of two microamps from the ultraviolet-sensitive tube is necessary to prove the flame radiation circuit and indicate a minimum satisfactory flame condition to assure safe burner operation.

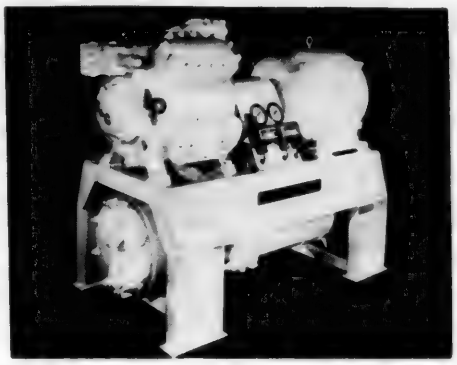
Since all types of flame emit light in the ultraviolet spectrum, the company reports, it is possible to use the system with all fuels, including gas-oil combinations, and on both single and multiple burners. The sensor responds only to ultraviolet light, with the result that it is not affected by hot refractories, incandescent light, hot metal parts or any flickering radiation in the visible or infrared regions.

The self-contained system, which can be installed in both new and existing burners, includes the ultraviolet-sensitive tube and amplifier assembly. It is easy to install, since sighting-in can be accomplished quickly and no special wiring is required.

More information? Circle Item 32, postcard, last page.

Refrigeration Condensing Units

A complete line of commercial and industrial refrigeration condensing units, ranging in size from 7½ to 150 tons capacity, is announced by Bell & Gossett Co., Morton Grove, Ill. According to the company, the models, built low and compact, are the shortest units available today. The 7½-ton unit, for example, is only 54 inches in length.



All parts and components in the condensing units are manufactured by the company, thus facilitating part replacements and service. Components include compressor, motor, condenser, and base. Four compressor sizes (2, 4, 6, or 8 cylinders) are available.

An additional feature of the condensing units is a complete interchangeability of all parts. Part sizes in the components of small units are the same as those used in larger models, making it easy for the consumer to store spare parts for a multiple installation of various sized units.

More information? Circle Item 33, postcard, last page.

Tilting Motor Base

A reaction torque tilting motor base for automatic belted drive tension control under changing load conditions has been announced by Allis-Chalmers Mfg. Co., Milwaukee, Wis.

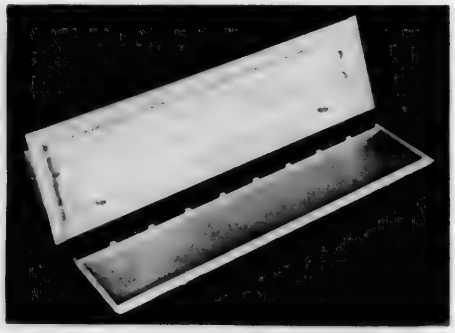
Available in bases to accommodate all NEMA sizes through frame 505 as well as for special applications requiring larger frames, the new reaction torque motor base makes possible more efficient use of space because of its compact design, the company states.

Engineered on the principle that action and reaction are equal but opposite, the motor base's reactive torque is directly proportional to the horsepower. The belt tension increases and decreases as the load varies.

More information? Circle Item 34, postcard, last page.

Light Fixture and Diffuser

A combination ceiling light fixture and low velocity air diffuser, sold under the name of Multi-Vent Troffer, consists of a drop-ceiling, flush, fluorescent lighting fixture, combined with a vertically-directed air diffuser. The unit is a product of Multi-Vent Div., The Pyle-National Co., Chicago, Ill. The fixture was created to help solve heating and air conditioning and ceiling decor problems of commercial and institutional buildings.



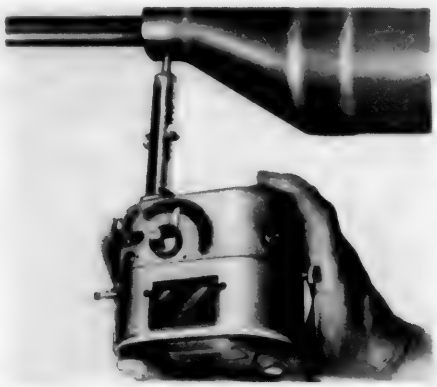
The low velocity air diffusion concept and system was developed by the company and a unit in modular and linear form has been on the market since 1952. The troffer combination is an expansion of that line. There is complete concealment of the air diffuser and complete flexibility and freedom of partition movement without relocation or adjustment of air diffusers.

More information? Circle Item 35, postcard, last page.

Records Vibrations Permanently

Called the Hand Vibrograph, a mechanically operated instrument, which magnifies and permanently records frequency, amplitude, and wave form of vibrations and other mechanical motions, is announced by The Korfund Co., Long Island City, N. Y.

Said to be highly accurate, weighing less than 5 lb, and compact, the apparatus makes recordings with both ink and waxed paper and has a tape take-up reel for convenient storing of readings. It has a variable tape speed to simplify reading of high frequencies.



According to the manufacturer, the instrument simplifies machinery maintenance scheduling since it provides a permanent record of the vibration amplitude at the time of installation. Comparing the vibration readings on tapes taken at regular intervals with this original tape establishes the amount of wear in bearings or cutting tools, indicating when replacement will be necessary, before breakdown. This permits maintenance operations on a scheduled, rather than emergency, basis.

The instrument can also be used to measure RPM of rotating equipment where shafts or rotors are not readily accessible by simply placing its probe against the machine housing.

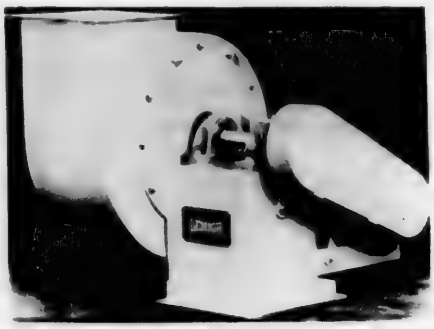
More information? Circle Item 36, postcard, last page.

For Constant, Over-Fire Draft

Significant fuel savings and lower stack maintenance costs are said to result when hand-or-mechanically-fired boilers are equipped with its specially-designed induced draft fans, it was announced by Lehigh Fan and Blower Division, a subsidiary of The Fuller Co., Catasauqua, Pa.

Featuring a radiant heat cover between the bearing and the fan housing, the fan maintains a constant, controlled over-fire draft, thereby increasing fuel combustion efficiency and eliminating need for large, unsightly stacks, the company states.

Capable of handling combustion gases up to 800 deg F,



the fan is of all-welded mild steel integral construction to prevent distortion at high temperatures. The radiant heat cover, together with an aluminum heat flinger device, prevents excessive heat radiation and permits use of standard pillow block bearings.

Stub stacks can be installed directly on the fan without additional supports due to the fan's heavy, all-steel construction. Direction of fan rotation and location of fan discharge outlets can be specified to suit any type of installation.

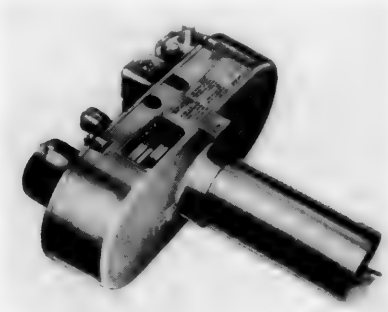
A manual damper with locking quadrant, or a ball bearing damper for automatic operation can be supplied as optional equipment. Dampers are installed in the fan discharge outlet and permit draft regulation without changes in fan speed. As the damper closes, horsepower load decreases.

Oversize multiple V-belt drives are used to provide continuous operation despite individual belt failure. Fans with motors of 5 hp and under are equipped with adjustable variable pitch sheaves on the motor shaft. Fans with larger motors have fixed drives and speed adjustments are made by changing the fan or motor sheave. Continuous duty normal torque motors are furnished.

More information? Circle Item 37, postcard, last page.

Power Inshot Gas Burner

Development of a power inshot gas burner, having an input range of 200,000 to 400,000 Btu per hr, is announced by The Nu-Way Corp., Rock Island, Ill. Designated Model G-400, the gas burner is designed for use in furnaces and boilers in large residential and small commercial buildings.



All operating parts and complete factory wiring are located on a quickly removable mounting panel. Simply by removal of 4 screws, panel can be removed from the sand-cast aluminum burner housing for maintenance. The shell-like aluminum housing serves to shield parts and wiring on the panel from heat.

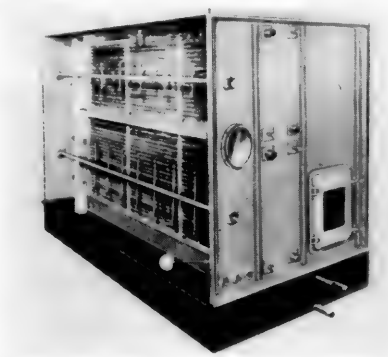
Without removing the control panel, orifices can be changed and air adjustments made using only a screwdriver. Both the opening to the orifice and the primary air control screw are in easily accessible locations on the exterior of panel.

More information? Circle Item 38, postcard, last page.

Sprayed Coil Dehumidifiers

A line of low pressure and high pressure blow-through sprayed coil dehumidifiers is available from Industrial Div., American-Standard, Detroit, Mich. The new units expand the American Blower line of draw-through dehumidifiers.

Blow-through models are reported to meet the most stringent requirements established by recent trends toward medium and high velocity all-air systems in multi-story buildings. Both low and high pressure units are avail-



able in 127 sizes with capacities from 2310 to 45900 cfm and for operation to 9 inches w.g. static pressure.

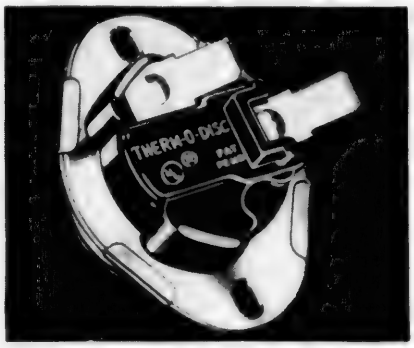
The heavy-duty units feature a casing designed to provide a unit that is air- and water-tight when used in single zone, multizone, or dual-duct blow-through systems. They are available with either direct-expansion Type X coils or chilled water Type W coils, as shown with inlet louvers removed. Both ends of the cooling coils are sealed inside the casing to eliminate sweating and dripping due to condensation. The sprayed coil dehumidifiers are designed to permit convenient removal of the coil units for maintenance or service.

More information? Circle Item 39, postcard, last page.

New Thermostat Series

Series 11-T thermostats are offered by Therm-O-Disc, Inc., Mansfield, Ohio, for operating temperatures up to 350 deg F. They have high electrical ratings while occupying a minimum of space, the manufacturer states.

General applications are: clothes dryers, washer-dryers, room and unit heaters, central heating furnaces, air con-



ditioning and ventilating equipment, aircraft, and miscellaneous devices. Operated on the company's free bimetal disc principle, units are UL-and CSA-listed.

Temperature calibration is factory preset and non-adjustable, with units designed for either single-pole, single-throw, or single-pole, double-throw operation. Variations in contacts, mountings, etc., are available.

More information? Circle Item 40, postcard, last page.

Pipe Made of New Metal

Introduction of a complete line of pipe, tubing, casing, fittings, and special castings made from American ductile iron, a new metal, is announced by American Cast Iron Pipe Co., Birmingham, Ala. The metal is reported to combine the corrosion resistance of cast iron with mechanical properties similar to those of steel.

A major application is for underground gas and water service mains where high pressures, extreme beam, and crushing loads, unusual shocks and stresses, unstable bedding, and deep fills may be encountered. According to the company, under such conditions its pipe will actually twist and bend without breaking.

The products are rigidly tested in accordance with ASTM specifications, and are said to meet and exceed the requirements of specifications applicable to gray cast iron pipe.

More information? Circle Item 41, postcard, last page.

Wall Exhausters

A line of centrifugal wall exhausters is announced by Power Line Fan Co., Plainfield, N. J. Units are made of heavy-gage aluminum and are said to provide high-capacity air movement at very low noise levels. They are recommended for schools, hospitals, laboratories, or for any sidewall ventilating system.

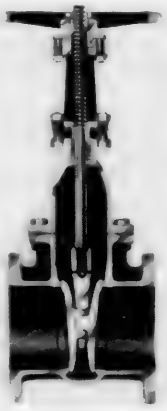
Among the features of this line, according to the manufacturer, are: rubber-mounted, ball-bearing motors of standard NEMA design, permanently lubricated in a weatherproof enclosure; spun aluminum housings designed to minimize turbulence and noise; airfoil contoured wheel blades; wire mesh bird screening; an external conduit arrangement for easy wiring; accessibility for servicing; automatic back draft dampers, rim mounted, for wall or duct installation; and epoxy resin coating for corrosion resistance.

Catalog sheets, complete with photos and specifications, are available.

More information? Circle Item 42, postcard, last page.

Split Wedge Valves

Split wedge stainless steel gate valves, announced by Jenkins Bros., New York, N. Y., are made of Types 316 and J-20 alloys suited to a wide range of corrosive conditions. The valves are fitted with a split wedge of ball-and-socket design which automatically adjusts to the tapered seating surfaces. The discs, revolving freely in the wedge carrier, produce a self-cleaning action on the seat which reduces the possibility of galling and seizing, the company states.



Among other features of the valves are a two-piece packing gland design said to eliminate binding of the follower when gland bolts are tightened unevenly; chevron-type Teflon packing, body of through-port design, end flanges conforming to MSS SP-42 Specifications. Size range of the 150-lb flanged end valve, Fig. 1327, is from ½ to 8 inches; of the 200-lb screwed end valve, Fig. 1326, from ½ to 2 inches.

Complete details are given in the new catalog of stainless steel valves, No. 59 SS.

More information? Circle Item 43, postcard, last page.

Miniature Refrigeration Unit

Air conditioning applications of unconventional design are suggested by Anthony J. Ross, A, J. Ross Enterprises, Elmhurst, Ill., based on his latest invention, a miniature refrigeration unit. The freezing cylinder, as illustrated, is 2 inches long, ⅜-inch dia, and serves as a complete evaporator for a Freon 12 system. The only special part is a small helical conveyor that removes ice flakes from the cylinder's exterior.

The assembly was designed to produce small amounts of flake ice needed in portable beverage coolers but, according to Mr. Ross, tests show operating characteristics and efficiency of heat transfer that point to marketable applications in the air conditioning field, such as for homes, refrigerated trucks, and freight cars.

As an example, the inventor utilized the evaporator in his warm air furnace at home to achieve what he reports as an excellent comfort cooling system. A conventional room conditioner coil was installed in the furnace with condensate drain provision. To the coil and a sump was connected a 1/15-hp water pump controlled by a room thermostat. In the sump was placed the tiny evaporator served by a conventional 2-hp compressor and condenser. The helical conveyor for the ice formed in the sump was driven by a 1/15-hp motor. Control for the system was provided by a home refrigerator type control consisting of a thermostat placed in the sump to keep the water temperature above 32 deg F.

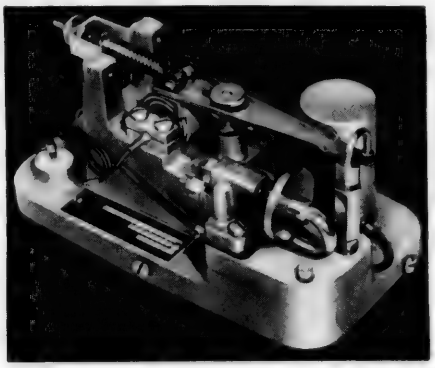
This air conditioning system worked very satisfactorily, Mr. Ross states, with all rooms cooled and partially dehumidified on the hottest days. The operation proved trouble free. The coil, operating at 32 deg, is said to be more advantageous than the conventional coil operating at 40 to 50 deg. The refrigerating unit, operated at 0 deg inside the sump, maintains a cold reservoir that smooths out room temperature changes. In this way, the system takes advantage of the more highly efficient water-to-metal heat transfer.

More information? Circle Item 44, postcard, last page.

Temperature Transmitter

A versatile and simple temperature transmitter, Model 202T Sensaire, is offered by Taylor Instrument Companies, Rochester, N. Y., for low-cost temperature measurement in the minus 30 to plus 1200 deg F range.

Unit has few moving parts, assuring longer effective service life. A thumb-screw adjustment zero sets over a wide range. Further range limits and operational spans can be established, as needed, in the field. Only the substitution of a different pre-calibrated and fully compensated thermal system is required. No other changes are necessary, and no barometric effect is noted, the company states.



The transmitter is described as a sturdy compact unit, unaffected by normal plant vibration, incorporating the smallest bulb presently available in a filled system, Standard Fulscope type relay, where desired, and standard Speed-Act unit may be had, also.

A universal-type mounting bracket permits installation almost anywhere; on flat surfaces, pipe lines, well wrench heads, on pipe hangers or on separable bushings; and with various degrees of rotation.

More information? Circle Item 9, postcard, last page.

Compact Magnetic Controls

Furnas Electric Co., Batavia, Ill., announces its Class 41 contactor line rated in 20, 30, and 40-ampere sizes for air conditioning and refrigeration, and also rated through 10 hp, 220 volts and 15 hp, 550 volts polyphase for across-the-line control of electric motors, heating and lighting loads. These same controls are also rated for resistance heating loads through 40 amperes.

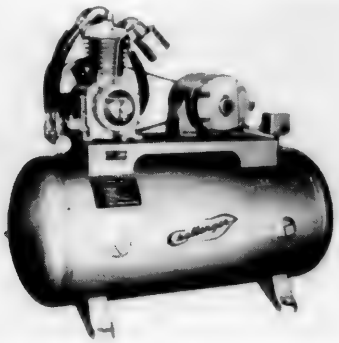
Magnetic contactors with 550 volt ratings feature compact design, replaceable contacts and coil, moisture resistant coil, pressure terminals, and "no-kiss" potential solenoid which means once the solenoid starts to pull-in, it will automatically follow through all the way to the sealed position without hesitating at the point of contact make.

Molded magnet coils are moisure resistant. These coils are also available with screw type terminals, quick connect terminals, or with wire leads.

More information? Circle Item 10, postcard, last page.

Lower-Priced Air Compressors

Introduction of its Challenger line of air compressors is announced by Champion Pneumatic Machinery Co., Princeton, Ill. They are priced in a lower range than the standard line.



Compressors are available in one to 3-hp sizes with 5.1 to 12.25-cfm displacement. Motors, switches, controls, and tanks are exactly the same as those used in the more expensive line, the company states. A number of units in the new line have already been sold to the armed forces.

More information? Circle Item 11, postcard, last page.

Capillary Control Valve

A capillary control valve, Part MCC-1, designed for use in reverse cycle systems, is introduced by Watsco, Inc., Hialeah, Fla. It is installed in conjunction with the capillaries between the high and low sides of the system, to provide single capillary restriction for the cooling cycle and double capillary restriction for the heating cycle.

Valve body is made of hot forged brass and hard drawn copper tubing, silver brazed. The action employs a Swedish spring steel disc and an alnico permanent magnet. A built-in 80-mesh monel strainer affords maximum protection to the capillary tube, the company states.

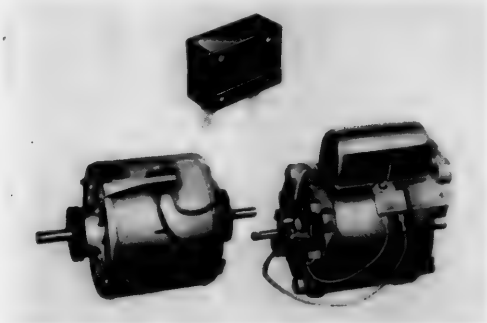
During the cooling cycle, pressure opens the disc, allowing single capillary restriction; on heating or reverse cycle, the pressure closes the disc and the refrigerant passes through both the secondary and the primary capillary for double restriction. Valve is applicable to all units up to and including 5 tons and may be used for either single or multiple capillary installations. Flow can be regulated by the size of the capillaries used. There are no springs to be affected by heat. According to the manufacturer, valve replaces two ordinary check valves, thereby cutting installation time and costs in half. Connection opening can be made to specifications.

More information? Circle Item 12, postcard, last page.

Motor Overload Protector

An overload protector, for fractional horsepower motors, which trips in response to either rising temperature of the motor or excessive current draw is introduced by Mechanical Products, Inc., Jackson, Mich.

The breaker, known as the MP-1620, is particularly adaptable to the use of fans, disposal systems, air conditioners, refrigerators, freezers, pumps, and other equipment or installations that have fractional horsepower motors. It automatically shuts off current when motor temperatures or current rises dangerously and then restores motor operation when the temperature or current is dropped.

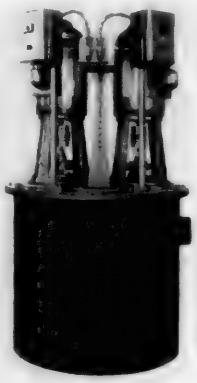


Unit (at top in photo) attaches to the surface of the motor housing with either a cold rolled steel box bracket, secured by the same screw that secures the motor's capacitator (as shown at right), or a clamp that goes under the head of one of the motor's through-bolts (shown at left).

More information? Circle Item 13, postcard, last page.

Underground Return Units

Announced by Federal Pump Corp., Brooklyn, N. Y., are Type RV heavy-duty, vertical underground condensation return units which are designed and constructed for industrial, commercial, institutional, and residential installations where gravity condensate return lines are located at or below floor level.



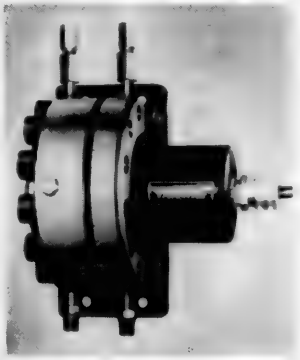
The units are completely assembled and vapor tight: motor, ball thrust bearing, and electrical control equipment are elevated above cover of receiving tank. Each pump and motor assembly and each float switch assembly is equipped with an individual gasketed support plate so that either or both can be removed without disturbing receiving tank cover plate or other equipment mounted thereon.

Quiet operation, dependable performance, and accessibility are incorporated in these units, the manufacturer reports.

More information? Circle Item 14, postcard, last page.

Differential Pressure Transmitter

Success of its remote liquid level indicator has led to the development, by Yarnall-Waring Co., Philadelphia, Pa., of a similar instrument operating without visual indication, and controlling a distant indicator, controller, or other electrically-operated receiving instrument. This new product is the Yarway differential pressure transmitter.



The instrument consists of a diaphragm mechanism in a pressure housing with pressure connections at the bottom, and a sensing coil which operates the remote receiver. The sensing coil is protected by a weatherproof cover. Cable connection to receiver is shown at right end of this cover.

Differential pressure transmitter can be mounted at any convenient location. It is connected to the liquid vessel, fluid line, or other container by two tubes. At the transmitter, the tube connections lead to opposite sides of a diaphragm. Variation in the differential pressure on diaphragm causes change in output of sensing coil which is transmitted to the remote receiver. The transmitter offers dependability, fast response, simple installation, and broad range adjustment without altering or replacing working parts.

More information? Circle Item 15, postcard, last page.

Introduces Four New Filters

Introduction of four mechanical type filters is announced by Mine Safety Appliance Co., Pittsburgh, Pa. They are the Dustfoe, the Honey Comb Ultra Aire, the Air-O-Kay, and the Compressed Air Line Ultra filter.

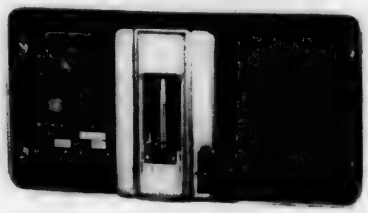
The Dustfoe space filter, of 1000-cfm capacity, is being offered initially in the 24 by 24 by 6 inch size. It is recommended for use in any application presently being served by an electro-static type precipitator. Although operation expense may be comparable to conventional equipment that is performing perfectly, the company says, the first cost is only one-tenth as much. Applications suggested include the electronic field to protect sensitive gear and system against damage from dust and dirt; the photographic industry to filter incoming air during manufacture of film; research laboratories; and hospitals.

Incorporating the standard honeycomb fold, the Ultra Aire filter includes additional reinforcing honeycomb structures at either face of the main filter body, serving as a pre-filter and providing extra strength for handling, storage, and use. It is said to be especially suited to AEC applications. The Air-O-Kay is a roughing filter which can be used wet or dry to protect and extend the service life of the more efficient units. The compressed air Ultra filter is for use with small tools and pneumatic lines.

More information? Circle Item 16, postcard, last page.

Combination Unit Heater Control

Type CUH combination unit heater control, by Sarcotherm Controls, Inc., New York, N. Y., is said to be the smallest, most compact device of this type made. It combines in one enclosure a number of accessories used in unit heater control. All of the equipment is mounted on



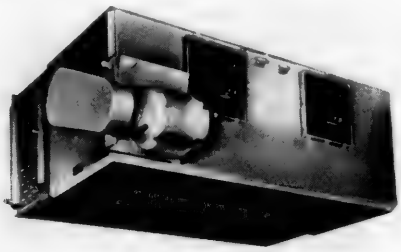
the removable cover plate of a standard 3-gang wall box, which facilitates installation and wiring. The CUH control may be either wall-mounted or flush-mounted by means of a special adaptor furnished.

Control includes an acurate line voltage thermostat, manual starter with thermal overload protection, summer-and-winter switch that permits fan operation alone in summer, pilot light indicator for fan operation, and terminal block accommodating line to service, fan motor, and optional low limit aquastat or pressure stat. Wall box dimensions are 8⅛ inches wide, 4½ inches high, and 1⅝ inches deep.

More information? Circle Item 17, postcard, last page.

Condenser Serves Dual Purpose

A new blower type air flow air-cooled condenser is announced by McQuay, Inc., Minneapolis, Minn. Features of the "AL" Aircon include low-silhouette appearance, making roof installations barely visible from the ground, and minimum space requirements for indoor ceiling suspension.



The unit is designed with a practical approach to the utilization of condenser heat. When equipped with optional accessories, it serves the dual purpose of heating and ventilating, as well as refrigerant condensing.

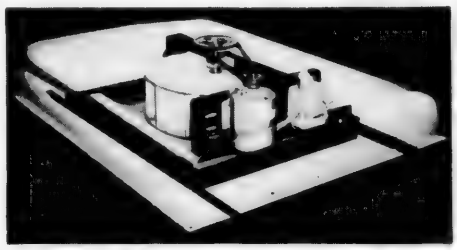
Available in seven models with nominal capacities ranging from 10 to 50 tons, for either indoor or outdoor applications, its design incorporates forward-curved, centrifugal fans with large outlet housings to insure quiet operation. Sixteen different unit arrangements and six different fan discharge arrangements are available.

More information? Circle Item 18, postcard, last page.

Streamlined Exhaust Fans

A line of roof exhaust fans with streamlined silhouettes is announced by Penn Ventilator Co., Inc., Philadelphia, Penn. Constituting the company's Low-Contour Dynafan line, they are nearly 50% lower than conventional fans the company states, and are more stable and have less shimmy.

Units are said to be weatherproof, powerful, and unobtrusive. For uniform appearance, the same housing is available for use in supply and relief units. The motor has been removed from the top of the wheel. The over-



hung shaft has been eliminated. According to the manufacturer, by placing the motor parallel to the wheel, the height was reduced, and by using a straddled bearing design, the sound level was reduced. Wheels are supported between ball bearings located above and below the wheels. The entire fan unit floats on rubber vibration eliminators, and longer life for bearings and belts result.

Units are available in 15 models and in a wide range of motor powers, fan speeds, and air capacities. Heights range from 14 to 36 inches; lengths from 33 to 144 inches.

More information? Circle Item 19, postcard, last page.

Gas Light Control System

An inexpensive control system for gas patio lights has been developed by White-Rodgers Co., St. Louis, Mo. The system automatically turns gas lights up at sundown, and turns them down again at dawn.

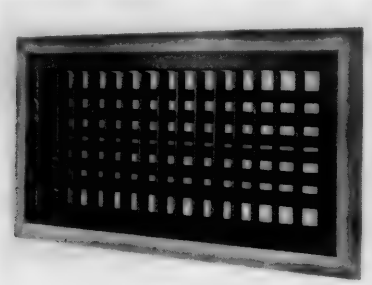
System is composed of an automatic gas valve, Type 25A17A, which fits inside the lantern post, and a photocell. At dusk, the photocell turns the lantern up. At dawn, the valve is automatically turned down, allowing just enough gas by-pass to maintain standby flame and provide ready ignition when the photocell again calls for gas. One valve can operate as many as four lanterns.

More information? Circle Item 20, postcard, last page.

Removable-Core Grilles

A line of grilles featuring removable cores and separable frames, yet maintaining a free area equal to that of conventional models, has been developed by Waterloo Register Co., Inc., Waterloo, Iowa. The compact grilles not only offer increased flexibility of design but also occupy no more wall space than conventional types.

An undiminished free area is maintained by means of a unique frame design that permits removal of the grille core without removing the outer separable frame. For



a streamlined appearance suitable for most finishes or interiors the separable frames have tapered edges.

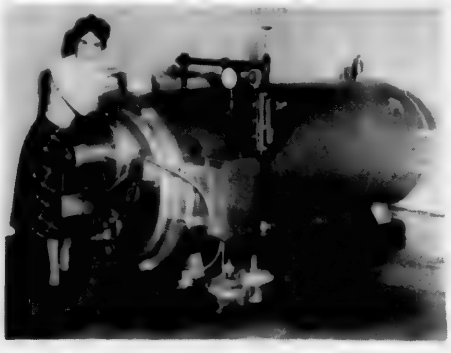
Cores can be removed for cleaning or refinishing without removing the outer frame. This avoids damage to plaster, paint, paper, or other wall decoration. Where a multi-shutter or opposed-blade damper is attached to the grille face, the damper, which is an integral part of the unit, removes easily without disturbing the outer separable frame.

Frames are made of extruded aluminum to resist corrosion. All-aluminum construction or aluminum frames with conventional cores may be specified. The removable core feature is adaptable to all supply and return grilles or registers in the company's line.

More information? Circle Item 21, postcard, last page.

Packaged Boiler Refinements

Redesigned space-saving package boilers, suited for comfort heating applications in schools, churches, institutional buildings, apartments, commercial and indus-



trial plants, were displayed by Cleaver-Brooks Co., Milwaukee, Wis., at the ASHAE show in Philadelphia.

The firm displayed a 30-hp Progress packaged boiler for small and medium low pressure steam or hot water applications, and a 125-hp C-B packaged boiler for medium and larger heating installations. Prominence was also given to the firm's move into the water tube boiler field through the acquisition of Springfield Boiler Co., of Springfield, Ill.

Foremost among the design changes is a single-tip, retractable nozzle on the C-B model which greatly simplifies cleaning and maintenance. Now, with a single flip of a drawer catch, the nozzle assembly is easily removed for quick cleaning, and just as easily returned for operation.

Other features include an inspirating pilot to maintain and produce a pilot flame at zero gas pressure, and a rotary air damper to modulate air for combustion.

A 40-hp Progress packaged boiler is shown in photo.

More information? Circle Item 22, postcard, last page.

Floor Slab Insulation

Armalite, a foamed plastic insulating material developed by Armstrong Cork Co., Lancaster, Pa., originally for low temperature applications, is introduced in scored board form for use both as a perimeter and cavity wall insulation.

Extensive tests have shown that the board will greatly reduce heat loss from a warm floor slab to a cold foundation wall when used as a perimeter insulation in concrete slab-on-grade construction. Similarly, as cavity wall insulation, it provides extra comfort and fuel savings by effectively reducing heat flow through the wall, the company states.

Scored board is available in 24 by 72-inch pieces, 1, 1½, and 2 inches thick. Each board is scored lengthwise into four-, eight-, and 6-inch wide sections, and it may be snapped at any score mark, practically eliminating the need for measuring, cutting and sawing. (See photo.)

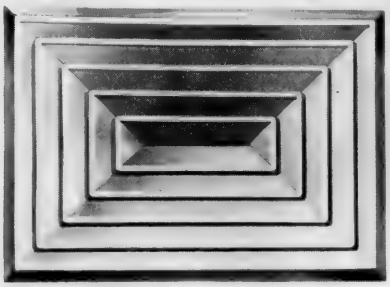
The board is made from white polystyrene beads in plain and self-extinguishing types. The material has a k factor of 0.25 at 75 deg F mean temperature. According to the manufacturer, although it weighs only approximately 0.10 lb per board foot, Armalite can support loads of 720 lb per sq ft with only 5% compression. The cellular structure prevents entrance of water by capillarity and keeps insulating efficiency high in service.

More information? Circle Item 23, postcard, last page.

Diffuser Line Improved

An improved line of square, rectangular and In-Line diffusers is announced by Carnes Corporation, Verona, Wis. The square and rectangular types are available in one, two, three, and four-way blows with six frame designs to fit all types of ceiling applications. The square sizes in any blow are available with round necks.

Unipattern vanes are said to insure uniform air pattern



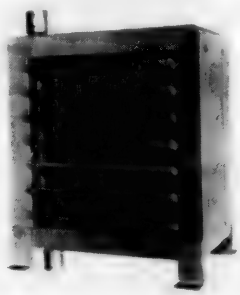
for all designs. Unique spring catch locks the inner section in place but does not prevent the easy removal of the inner section without tools. All inner vane sections can be changed from one blow to any other desired blow. The In-Line diffusers are available in one or two-way blow. Every diffuser has a baked enamel finish said to be suitable for use with many interior color decorations.

More information? Circle Item 24, postcard, last page.

Horizontal-Flow Unit Heater

A horizontal-flow heater that offers greater ease of accessibility to heater interior while in installed position is announced by L. J. Wing Mfg. Co., Linden, N. J. The heater is offered in five different sizes.

This lightweight, suspended, steam unit heater is suitable for garages, offices, stores and small industrial and



commercial applications, where it may be desirable to obtain heat distribution by using one or more heaters.

The two-piece, wrap-around casing can be easily removed for access to the heater section without disturbing steam connections. The header-tube connection is by a mechanical joint, instead of the conventional welded joint. This permits simplified replacement of individual tubes, should that be necessary, instead of installing an entire heating section. Heat discharge is horizontal with individually adjustable deflector vanes. The heating element is the company's Featherfin extended surface type.

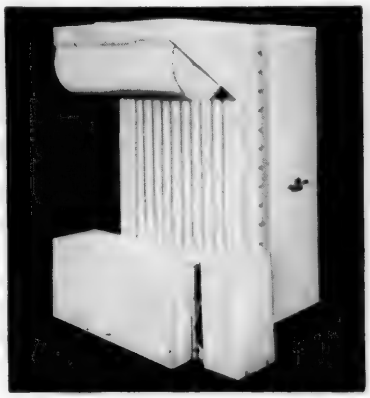
More information? Circle Item 25, postcard, last page.

Compact Automatic Filter

American Air Filter Co., Louisville, Ky., announces Type B Rollotron, which is a new design of the basic Rollotron agglomerator-filter principle introduced by the company.

The new model is reported to combine the high efficiency of an electronic precipitator with the low maintenance of an automatic renewable media filter.

In this compact unit, dry electrostatically-charged



plates are used to agglomerate atmospheric contaminates, such as dirt, basteria pollen, and smoke. The agglomerated particles (including submicron sizes) are held together by intermolecular attraction until they are picked up by the air stream and deposited in the renewable media of the storage section. There the accumulated dirt is automatically wound into a compact roll for easy disposal. Resistance to air flow is uniform and constant, and filter performance is always at optimum level.

More information? Circle Item 26, postcard, last page.

Thermostatic Expansion Valve

A heavy-duty thermostatic expansion valve, said to assure extremely smooth performance and accurate modulation and eliminate valve "hunting," has been designed specifically for heat pump applications by Heating and Air Conditioning Controls Div., Controls Company of America, Milwaukee, Wisconsin.

Model 214 heat pump pump valve is available for Refrigerant 12 or 22 with either a standard liquid-charged or pressure limiting charged power element. Capacity ranges for the valve in Refrigerant 12 systems are 1, 2 and 3 tons; in systems using Refrigerant 22, it has 2, 3 and 5-ton ratings. The valve is available with either adjustable or non-adjustable (factory-set) superheat.

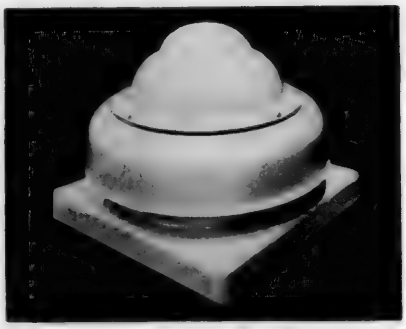
Valve has solder-type inlet and outlet connections. Inlets are standard in $\frac{3}{8}$, $\frac{1}{2}$ and $\frac{5}{8}$-inch OD solder; outlets are $\frac{5}{8}$, $\frac{7}{8}$ and $1\frac{1}{8}$-inch OD solder.

More information? Circle Item 27, postcard, last page.

Fiberglas Power Ventilator

A new power ventilator has been developed by The Swartwout Co., Cleveland, Ohio. Called Fiber-Aire, this unit is fabricated of heavy, shock resistant, and sound absorbing Fiberglas. Structurally equal to steel and with greater impact strength than steel or aluminum, the bonded housings are virtually impossible to dent, crack or break.

Because Fiberglas is a non-resonant material, it elimi-



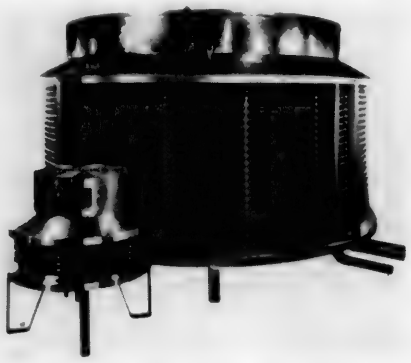
nates the sound chamber effect created by conventional centrifugal power units. In addition, the company has eliminated the typical pipe struts used to support the dome in favor of staggered air flow guides. This eliminates internal air shocks, cutting vibration further and increasing efficiency. Low contour and molded-in sky blue color enhance building design.

Three-piece housing cuts shipping weight and makes installation faster and easier. The housing is unaffected by salt spray, gases, greases, moisture and most common acids. Since motors are permanently lubricated, ventilators require no maintenance. Units are available for immediate delivery in 21 direct and belt drive models with capacities from 180 to 4000 cfm.

More information? Circle Item 45, postcard, last page.

100-Ton Condenser

Addition of a 100-ton unit to its Fandaire air cooled condenser line is announced by F5 Air Conditioning Corp,. Tulsa, Okla. The completely self-contained unit is said to have all of the advantages of the smaller units in the line. It is pictured in back of a 3-ton unit.



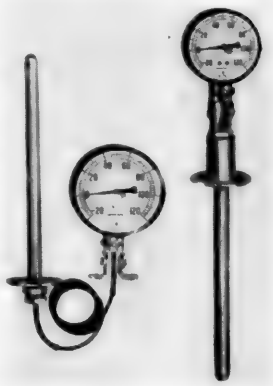
Among its features are listed its circular coil design, said to permit true counter flow of hot refrigerant against cooling air and straight-through flow, permitting positive condensate drainage, since each coil circuit is one continuous length of a single tube. All pressure drop caused by return bends in rectangular units is eliminated.

The shoulder of each fin is firmly swaged to the tube and to the adjoining fin, said to prevent corrosion or foreign matter between fin and tube, and thereby maintain good heat transfer. Fans on the 100-ton unit are of cast aluminum with adjustable-pitch blades.

More information? Circle Item 46, postcard, last page.

Duct Thermometers

Dial thermometers, specifically developed for use in ducts, are announced by Jas. P. Marsh Corp., Skokie, Ill. A major consideration in developing the duct thermometers has been ease of reading, assured by the large legible dial, and the universal joint which permits the dial to be swivelled or tilted to any convenient reading angle regardless of the positioning of the flange on the duct. Flange is provided with an extension neck that will clear the insulation of all insulated ducts.



Two types of duct thermometers, as illustrated, are available: Direct-mounted type, for location at the point of measurement, and distant-reading type, with 6 ft of capillary tubing, for application where it is desirable to have the dial some distance away from the point of measurement. Thermometers are the filled type.

More information? Circle Item 47, postcard, last page.

Medium-Sized Oil-Fired Boiler

Its A-5 oil-fired boiler is announced by American-Standard Heating and Plumbing Division, New York, N. Y., for use in large homes and small to medium-size apartment and commercial buildings. Available for either steam or hot water installations, the boiler is specifically designed for installed capacities ranging from 195,000 to 622,000 Btu per hr.

A unique aspect of the boiler is a tankless heater arrangement. A separate heater may be inserted in each center section. This allows the boiler to produce multi-temperature water for automatic dish washers and washing machines; another heater can supply lower temperature faucet water; a third heater, water for snow melting, for instance.

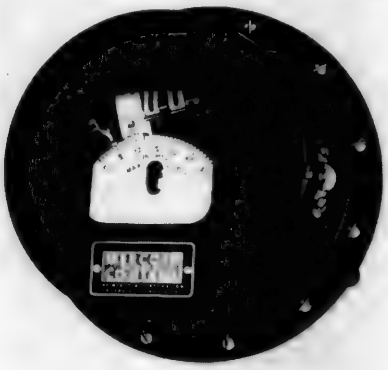
Only a one size tankless heater is required with the boiler, for hot water or steam heat, no matter how many sections it may have. A preassembled copper manifold is available for connecting multiple heaters to reduce the installation time.

More information? Circle Item 48, postcard, last page.

New Low Pressure Control

A low pressure diaphragm control for air or gases is announced by The Mercoid Corp., Chicago, Ill. It features FM approval, external adjustment, calibrated dial (with pointer), visible on-off circuit, and a sealed mercury contact switch.

The control incorporates a single (acid-resistant Fairprene) diaphragm which actuates a mechanism for opening and closing a hermetically sealed mercury switch.



The diaphragm separates two pressure chambers, one of which may be used for positive pressure; the other for vacuum operation, but both chambers may be used to provide operation, due to a difference in pressure between them.

Classified as General Purpose NEMA 1, suitable for Division II, unit is enclosed in heavy-gage steel flanged case and finished in charcoal-gray enamel. Its operating range is from one to 30 inches of water, with maximum operating pressure of 20 psig. Several types are available, with a choice in electrical rating, etc., all fully described in Bulletin SEB-50, which is available from the manufacturer.

More information? Circle Item 49, postcard, last page.

Swimming Pool Heater

Using stainless steel supplied by Allegheny Ludlum Steel Corp., a new swimming pool heater is said to be

providing long heater life and doubling the swimming pool's usefulness.

The heater is made by Raypak Co., Inc., El Monte, Calif., and uses the stainless steel in an unusual way.

The stainless steel is made into small, tapered burners which fit into a filing-cabinet-type drawer. Twelve of the small burner elements generate enough heat for a pool measuring 15 by 35 ft. To enlarge the capacity, more stainless steel burner elements are added. It is possible in the Raypak heater to get up to 90 burners in a single drawer on the larger units. This would handle a pool 40 by 100 ft.

In many areas of the United States, pools can be used only three and four months of the year because the temperature of the water gets too low for comfortable swimming. With the use of a water heater designed for the purpose, this time period can be almost doubled. In the Southwestern states a heater makes a swimming pool a year-round item, and in Midwestern and Northeastern states makes swimming possible for six months of the year.

More information? Circle Item 50, postcard, last page.

Lightweight Roof Insulation

A new insulation, designed especially for use under built-up roofs, is introduced by The Dow Chemical Co., Midland, Mich. Trademarked Roofmate, the product consists of expanded polystyrene boards wrapped in laminated kraft paper. Measuring 2 ft by 4 ft, the boards come in thicknesses of 1, 1¼, 1⅝, and 2 inches depending upon the insulating value needed.

While priced in accordance with prevailing industry schedules, Roofmate, according to the manufacturer, offers several outstanding advantages. It has one of

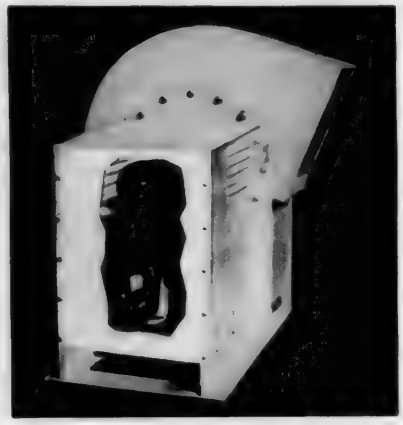
the lowest heat transmission rates of any commercially available insulation. Because it is waterproof its insulating efficiency does not deteriorate with age, as there is no moisture penetration to weaken the material's structural properties. In most cases additional vapor barrier is not needed.

It is extremely lightweight, each one-inch board weighing roughly 3 lb. This makes an easier job of laying the insulation, Dow says, results in reduced labor costs, and lightens roof loads. In spite of its light weight, it has a compressive strength of 3,000 lb per sq ft, providing a firm base for roofing materials and good resistance to wear and tear during roof construction. In addition to industrial flat or low-pitch roofs, Roofmate is seen to hold promise for residential use with gravel roofs.

More information? Circle Item 51, postcard, last page.

Utility Blower

A utility blower, announced by Robinson Ventilating Co., Zelienople, Pa., has a wide variety of industrial applications. The package unit is weather-tight with motor and mechanism protected by a steel enclosure. De-



sign and construction permits the use of an economical, open type motor which is fully protected from the elements, the company states.

Fabricated from heavy-gage steel and featuring heavy duty split pillow block ball bearings, the unit can be supplied in sizes to accommodate volumes from 650 to 16,200 cfm. Type J fan blade sizes ranges from 12 to 27 inches.

More information? Circle Item 52, postcard, last page.

Incinerator Draft Control

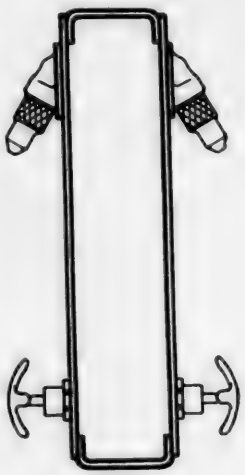
An incinerator draft control is announced by Heating Products Div., Wm. Steinen Mfg. Co., Newark, N. J. It is said to meet all requirements of the Board of Fire Underwriters.

The draft control introduces unheated air into the stack, cooling the stack and reducing stack drafts to prevent sudden peaks in burning rates. This greatly minimizes fire hazards, the company says. Thus, this control (1) prevents high temperatures in the incinerator and in the stack, (2) reduces the fly-ash in the stack, (3) increases the life of the incinerator and the stack, and (4) saves considerable clearance space in the design of domestic incinerators and flues. The company offers its Incinerator Draft Control Bulletin.

More information? Circle Item 53, postcard, last page.

Multiple Showers

A Belanea type Showergon, available in units of four, six, eight, ten, or twelve shower stations in back-to-back arrangement, is announced by The Logan Mfg. Co., Glendale, Calif. The basic stainless steel unit embodies concealed piping, shower combinations, and soap facilities.



A choice of stock end supports and mounting brackets are supplied according to job or design conditions, such as wall-to-wall, low-wall, floor-to-ceiling, or free standing low stanchions. Any combination allows for versatility in application, the company says.

All exposed brass fixtures are triple chrome plated and assembled with vandal-proof screws. All interior portions are stainless steel, copper, or brass. All functional parts are readily accessible from the front for servicing or maintenance.

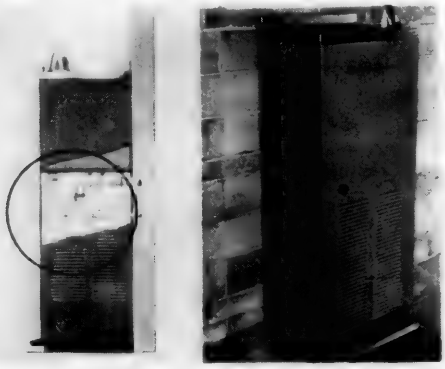
Fourteen gage stainless steel housing with a No. 4 commercial finish provides surfaces easy to clean and resistant to corrosion. Units are ready for installation.

More information? Circle Item 54, postcard, last page.

Flush-Wall Water Cooler

A water cooler that fits flush against the wall and eliminates exposed plumbing sets the pace for the 1959 water cooler line introduced by Westinghouse Electric Corp., Springfield, Mass.

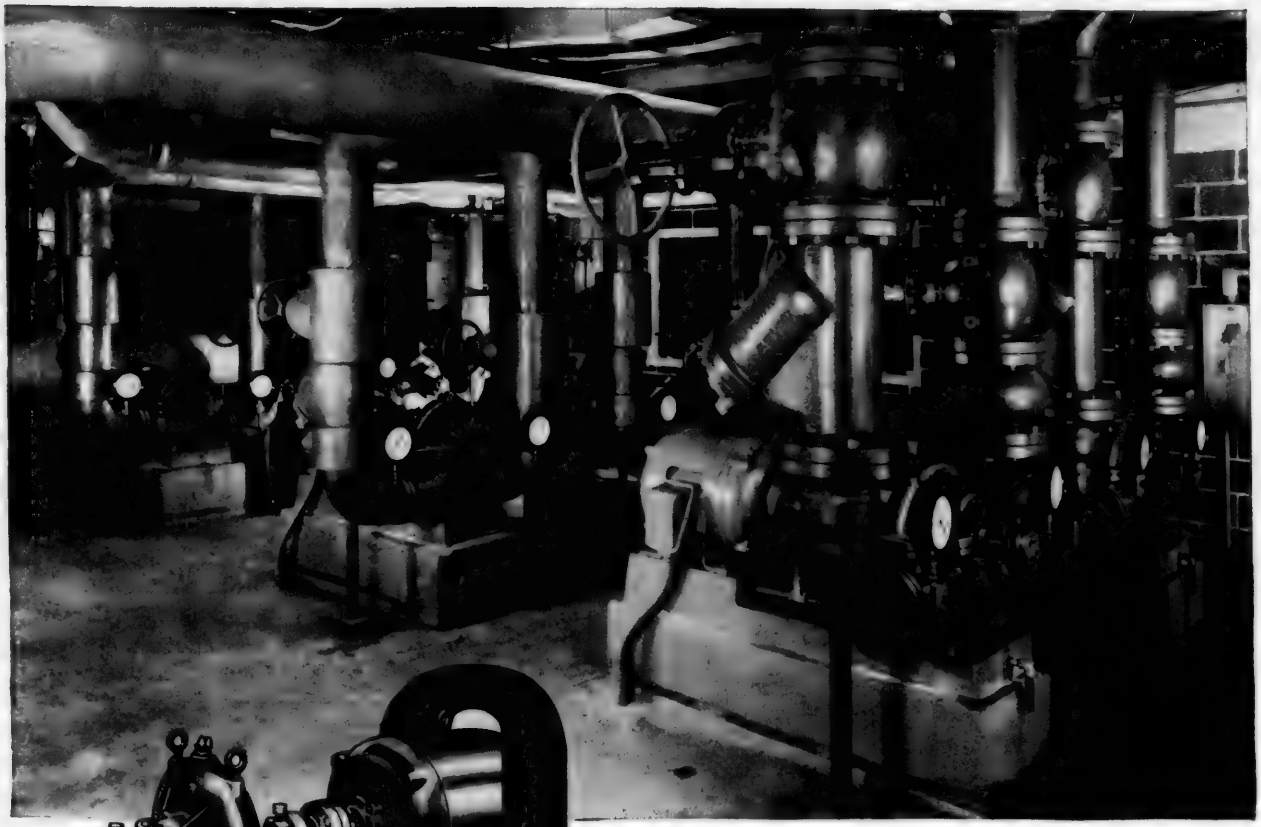
The Wall-Line cooler design allows for a standard trap



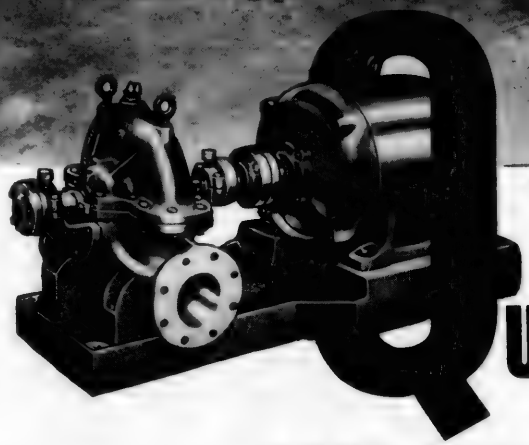
with slip-type fittings to be installed inside the cooler cabinet, as illustrated, with no need for time-consuming soldering or threading of drain or trap fittings. Cooler extends but 12½ inches when installed flush against the wall, and the floor area required is 26% less than the minimum area for a standard cooler installation.

More information? Circle Item 55, postcard, last page.

(Continued on page 110)



"Buffalo" Double Suction Single Stage Pumps Used for Condenser Water and General Service.



QUALITY SYSTEMS

NEED QUALITY PUMPS "BUFFALO" WILL BACK UP YOUR SELECTION

In clear water installations where a long life of maintenance-free dependability is desirable, you can rely on "Buffalo" Double Suction Centrifugal Pumps. "Buffalo" gives you quality design and construction. The "Buffalo" features listed at right speak for themselves. "Buffalo" Pumps combine the finest hydraulic design and workmanship with the best materials obtainable.

EXTRA Savings with Low Parts Inventory:

Because of maximum parts interchangeability, users of "Buffalo" Pumps enjoy lower parts inventories. The result is savings in money and space. Another advantage is greatly simplified inventory control.

Whatever your needs in clear water service, investigate the advantages of "Buffalo" Double Suction Pumps. Capacities from 10 to 14,000 gpm. For complete facts, write for Bulletin 955-S. Or better yet, contact your nearby "Buffalo" engineering representative.

Long Life, Reliable Operation Features of "Buffalo" Pumps Include:

- **Casings** — Precision-machined with ample water passages. Horizontally-split for quick inspection.
- **Impellers** — Designed for highest efficiencies, consistent hydraulic balance.
- **Ball Bearings** — Heavy-duty type, supporting each end of sturdy, oversize shaft.
- **Bronze Wearing Rings** — Are easily renewable. Thus rings only and not casing need be replaced.

"Buffalo" Pumps bring you the "Q" Factor — the built-in QUALITY which provides trouble-free satisfaction and long life.

BUFFALO PUMPS

Division of Buffalo Forge Co.

480 BROADWAY • BUFFALO, N. Y.

"Buffalo" PUMPS

Canada Pumps, Ltd., Kitchener, Ont. • Sales Representatives in all Principal Cities

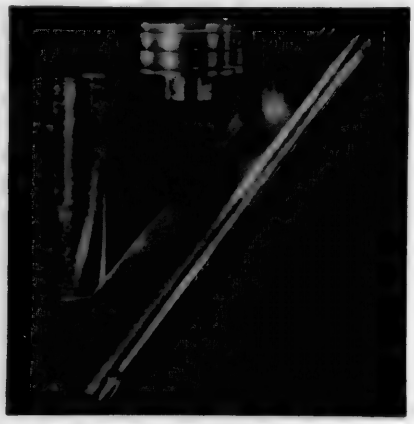
A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

(Continued from page 108)

Double-Wall Metal Gas Vent

A metal gas vent of double-wall design with interlocking joints is announced by Van-Packer Co., Chicago Heights, Ill., a division of The Flintkote Company. Unit is listed by Underwriters' Laboratories.

Vent is available in all standard sizes of round pipe from 3 to 20 inches diameter. It also comes in 4- and 5-



inch oval sizes for installations within the wall stud space. All necessary fittings are available to meet any building requirement, the company states.

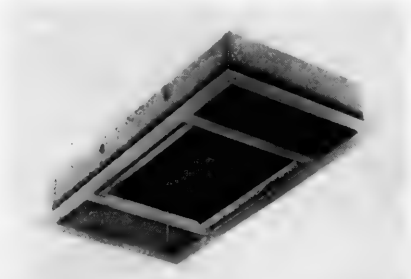
The double-wall, air-insulated design of the vent is said to provide space for active air movement and to ensure low wall temperature. The outer wall is heavy-gage galvanized steel; the inner wall is 0.016-inch aluminum which heats fast, quickly establishing good draft and preventing moisture condensation and acid formation. Interlocking joints permit assembly without tools.

More information? Circle Item 56, postcard, last page.

Radiant Heating-Lighting Unit

Production of a recessed ceiling unit combining electric radiant heating with built-in lighting is announced by Berko Electric Manufacturing Corp., Queens Village, N. Y., under the tradename Pyrolite, Model RCL. The unit not only effects major economies in space, but eliminates dual installations.

Commercial uses are in motels, offices, ticket and guard



booths, rest rooms and stores. In the home, the unit will find principal use in the bathroom.

Rated at 1000 watts of heating, it is mildly fan-forced to circulate convection heat normally stacked at the ceiling to all corners of the room. Its instantaneous, even heat is achieved by tempered Pyrex glass panels having an electrically conductive coating. The 200 watts of lighting banked on either side of the heating panel uses Corning's Alba-Lite for maximum illumination.

In typical installations, heating is controlled by a wall-mounted thermostat, lighting by a separate wall switch. Units are UL approved, available in 120, 208, and 240 volts.

More information? Circle Item 57, postcard, last page.

Commercial Finned Tube Cover

A commercial finned tube cover named Thermosil (Type T) has been introduced by Kritzer Radiant Coils, Inc., Batavia, Ill. It is applicable for institutional, industrial, and commercial applications.

Covers are 13, 14, 20 and 24 inches high with vandal-proof louvers in the top only, or top and front. Optional features include open or grilled bottom, and face inlet

grille. Flanged end construction of covers and accessories permits installations with clean line continuity and no visible screws, the company states. Optional plain end construction uses snap-on joint covers and other overlapping accessories for maximum flexibility.

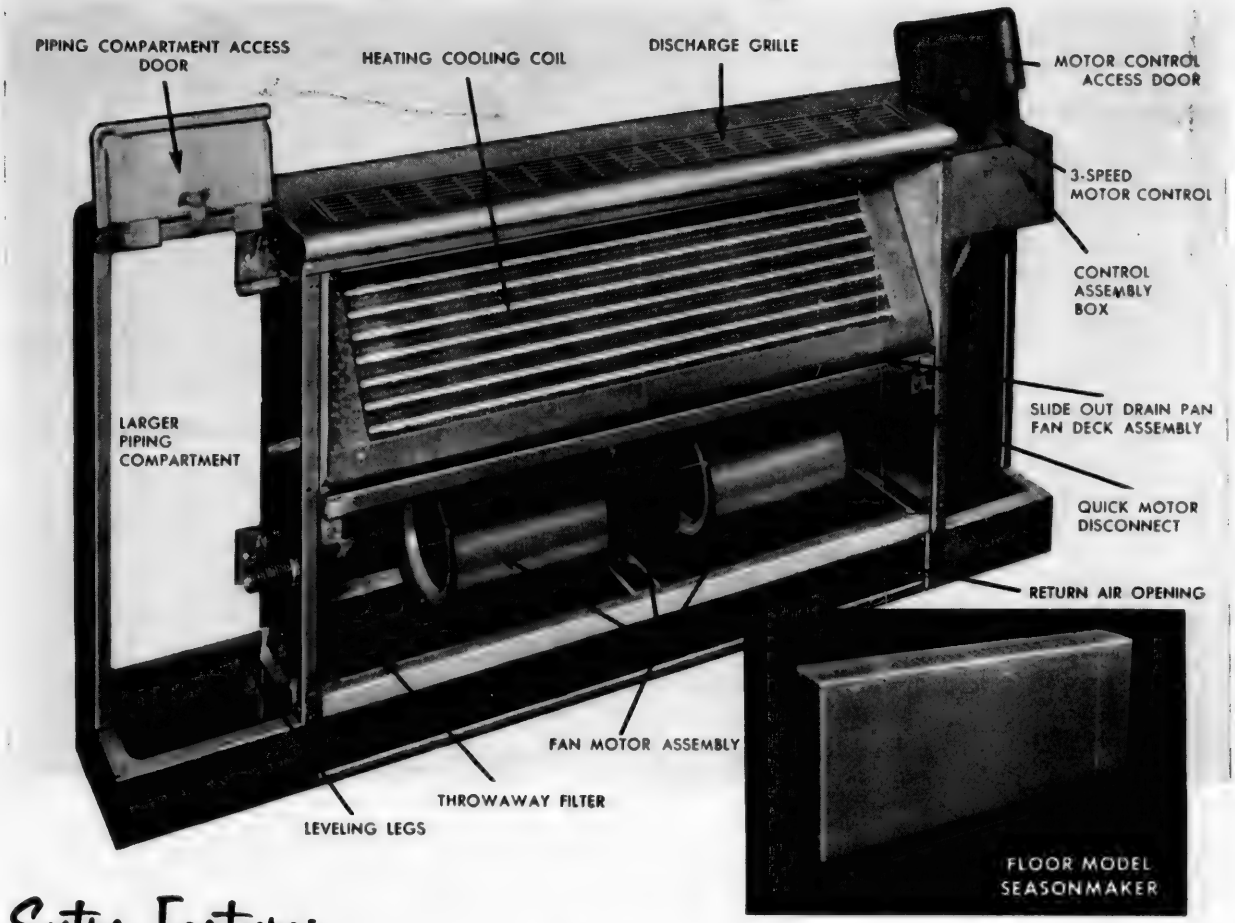
The company's coils of heavy steel pressure tube with steel fins, or copper tube with aluminum fins, are supported on 12-gage steel channel brackets, and adjustable stirrups. Coils ride on sliding shoes for silent operation during heating and cooling cycles.

More information? Circle Item 58, postcard, last page.

(Continued on page 112)

Manufacturers' Representative

If you are seeking new lines, we suggest you register your name, territory covered, and present lines with this publication. We get numerous requests from manufacturers seeking representatives and by registering you pave the way to lining up desirable accounts. Write to S. Larson, Research Director, AIR CONDITIONING, HEATING AND VENTILATING, 93 Worth St., New York 13, N. Y.



Extra Features Year 'Round Comfort

with these thin-line design SEASONMAKER REMOTE AIR CONDITIONERS

McQuay thin-line design individual room Seasonmaker units have been redesigned for modern, compact styling, and all are only 8½ inches thin and 25 inches high. There are four models—ceiling, hideaway, floor and basic—each in five sizes, affording a minimum of space necessary for installation.

All McQuay Seasonmakers utilize central station heating and cooling with capacities of 220, 330, 440, 520 and 640 cfm. The four smaller sizes are equipped with 1050 rpm motors, while the largest has 1500 rpm. They furnish individual room comfort at any desired temperature level—heated, filtered air in the winter and cooled, dehumidified and filtered air in the summer.

McQuay thin-line design Seasonmakers are ideal for multi-room buildings, such as hotels, apartments, motels, schools, hospitals, offices and residences. All have the three-row McQuay Ripple-Fin coils. They are ultra-quiet in operation and each, of course, has the inherent built-in quality for which McQuay is famous. For complete information, call the McQuay representative in or near your city, or write McQuay, Inc., 1619 Broadway Street N.E., Minneapolis 13, Minnesota.

4 MODELS IN 5 SIZES

EACH ONLY 8½" THIN, 25" HIGH

McQuay INC.

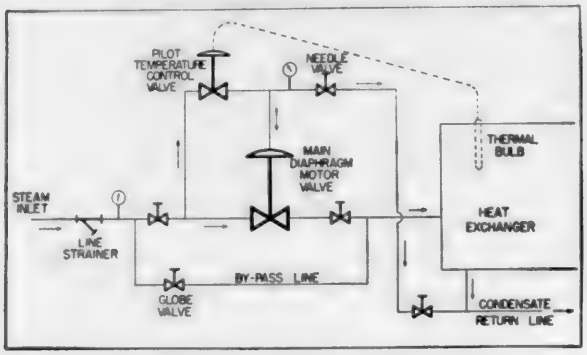
AIR CONDITIONING • HEATING • REFRIGERATION

(Continued from page 110)

Temperature Control Systems

Sliding gate and plate temperature control valves are available from stock in 4- and 6-inch sizes, announces Jordan Industrial Sales Div., OPW Corp., Cincinnati, Ohio.

Suitable for heating or cooling, these new valve systems capable of 50,000 lb per hr steam capacity, or 2,300 gpm of water, are said to accurately control temperatures from 35 to 450 deg F, and give dead-end shutoff.



Cast iron bodies are suitable for pressures to 125 psi, with temperatures to 450 deg. These thermal systems are available in copper, stainless steel, carbon steel, and monel.

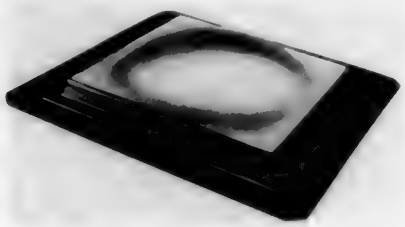
The diagram illustrates a 4- or 6-inch temperature control valve installation which can be used on heating or cooling service. A ¼-inch temperature control valve is used to pilot a 4- or 6-inch diaphragm control valve. This system will help solve the toughest application problems, the company states.

More information? Circle Item 59, postcard, last page.

Plastic Skylights in Color

Made of glass-fiber-reinforced plastic, Consolite Double Dome skylights are being produced in green, white, pink, yellow, and blue by Consolidated General Products, Inc., Houston, Tex. Units not only transform glaring sunlight into pleasing diffused interior light but also tend to create a specific interior mood.

The skylight is actually a twin-domed insulating plastic



bubble. The dead air space between its inner and outer domes gives it a *U* factor of 0.5, or insulation value equivalent to a 2½-inch gypsum roof. The result is a substantial reduction in heating and air conditioning losses common to conventional skylights.

Double thickness of reinforced plastic cannot be shattered by ordinary hailstorms, rocks, shock or vibration, the manufacturer says. Skylight has a flexural strength of 20,000 psi; tensile strength is 10,000 psi; it will support a uniform load of at least 200 lb per sq ft.

Skylights are available in three shapes—square, round, and rectangular—and in three basic models—self-flashing, in low and high silhouettes, and curb-mounting—in a variety of sizes ranging from 14 inches square to 38 by 74 inches. The various models range in weight from 10 to 55 lb.

More information? Circle Item 60, postcard, last page.

Automatic Water Softeners

Fully automatic water softeners, in single and double units, are introduced by The F. E. Myers & Bro. Co., Ashland, Ohio, to supply the soft water capacities and flow rates demanded in commercial establishments. Capable of 52-gpm flow rates, the softeners are recommended for use in smaller motels and hotels, apartment houses, institutions, small hospitals, large homes, farms, schools, and laboratories.

Four units are available with capacities from 69,000 to 430,000 grains of hardness between regenerations. A clock triggers regeneration at a pre-selected time of the day or night. Frequency of regeneration may be varied. Equipped with oval shaped brine tank, installation to conform to space requirements is facilitated. A five-year unconditional guarantee is offered, with an additional pro-rated five years.

More information? Circle Item 61, postcard, last page.

Vertical All-Weather Motors

The Louis Allis Co., Milwaukee, Wis., announces the availability of its all-weather Vertical Hollow Shaft motors in ratings of 1 to 30 horsepower. These climatized motors provide indoor and unprotected outdoor service on shallow or deep-well turbine pump applications for irrigation, petroleum product handling, chemical pumping, power plant condenser cooling, and other industrial installations.

More information? Circle Item 62, postcard, last page.

(Continued on page 114)

FICTION FACT

FICTION:
It costs less to buy replaceable filters and throw them away when dirty than to have permanent filters cleaned.

FACT:
R P Washable Industrial Filters can be cleaned 10 times annually for under $4.00 per year (including odor-removing adhesive and depreciation on filter).

RP®

Multi-Velocity Industrial AIR FILTERS

R P Multi-Velocity Industrial Air Filters are designed with ease and economy of operation in mind. Their strong, rugged aluminum construction increases service life—makes them fast, easy and safe to handle—reduces operating costs. Important additional savings too, by eliminating the need for heavy structural design in filter bank construction.

These high efficiency, multi-velocity filters meet all specifications for permanent-type washable filters—with the plus feature of ODOR REMOVAL through the use of R P Super Filter Coat—the water soluble dirt *and odor* removing adhesive, with the "built-in" detergent. *Write for information.*

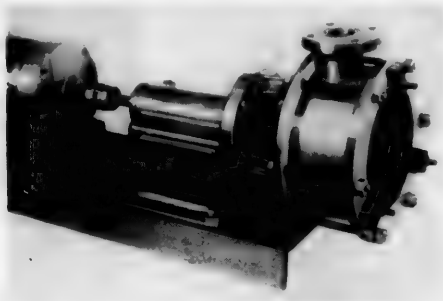
RP *Products of Research*

RESEARCH PRODUCTS *Corporation*
Dept. 47, Madison 10, Wisconsin

(Continued from page 112)

PVC Centrifugal Pumps

A line of PVC centrifugal pumps is announced by Vanton Pump & Equipment Corp., Hillside, N. J. This line is constructed with all wetted parts of unplasticized, unmodified polyvinyl chloride, offering a broad range of chemical resistance as well as the non-contaminating transfer of sensitive solutions. Available in four pump



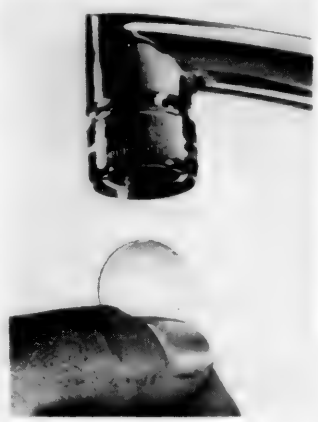
sizes, units offer capacities from 10 to 180 gpm with discharge heads to 100 ft. Solution temperatures to 140 deg F can be handled.

The heavy sectioned PVC casing is totally protected by a cast iron frame giving rigid support. The impellers are molded, and are of a dynamically balanced design; vanes are contoured to offer maximum efficiency.

More information? Circle Item 63, postcard, last page.

Pilfer-Proof Aerator

A pilfer-proof aerator, designed for use on faucets in commercial, institutional, and public buildings such as schools, hotels, factories, office buildings, and railroad and air terminals, is developed and marketed by Chase Brass & Copper Co., Waterbury, Conn. It is so designed that removal is impossible without a special key.



The exposed portion of the aerator consists of an external loose ring that turns freely so that it cannot be unscrewed by hand. The outlet end of the aerator body contains narrow slots that accommodate the special key supplied for removing and replacing the aerator. These slots are too narrow to allow use of either a coin or screwdriver for removal, and are so positioned that they are not in view after installation of the aerator. Interior construction is similar to the standard Chase Spring-Flo aerator. It is supplied only with a male thread.

More information? Circle Item 64, postcard, last page.

(Concluded on page 118)

YOUR IDEAS WORK BETTER WHEN YOU WORK WITH HONEYWELL

THE FOLLOWING PAGES bring you some of the latest developments in automatic controls from Honeywell. They widen your choice of products, give you more to work with.

For complete information on these new control products and systems, call your nearest Honeywell sales office. Honeywell provides 112 offices throughout the country; each staffed with control specialists to assist you in preparing proposals and writing specifications.

Look over these new products and systems. And, remember, they are backed by the kind of support only Honeywell can offer you.

Honeywell's New Selectographic DataCenter* uses floor plan and system projection for more compact installation!

It makes centralized control easier to design, install and operate.

Now an air-conditioning engineer can "see" up to 50 separate fan system diagrams and floor plans, read and adjust critical temperatures throughout a multi-story building . . . all at one console.

Here's additional savings added to centralized control. For Honeywell's selectographic design saves time, saves space, saves on extra construction. And it's an attractive addition to any building.

And Honeywell's modular building block design brings the system greater economy, new flexibility. Starting with the basic unit—the central Selectographic Console—other modules of a standard 2′ by 2′ dimension may be added as the need arises or as budget permits. Honeywell's Selectographic Supervisory DataCenter can be installed in buildings of all sizes, for all purposes—can grow with the structure itself.

For more information about this panel, call your local Honeywell office. Or write Honeywell, Dept. HV-3-50, Minneapolis 8, Minn.

FOR MORE TO WORK WITH WORK WITH HONEYWELL

Honeywell

*Trademark

First in Control

Honeywell's control team gives best year-round air conditioning unit ventilator performance

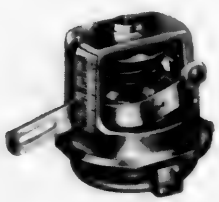
The Honeywell Pneumatic wall-mounted thermostat is the ideal way to control classroom temperatures. It senses temperatures the way the occupants do, gives exact temperature readings, delivers the exact temperature set. The Honeywell Pneumatic Round is more precise, responds faster than any other pneumatic thermostat on the market.

The Honeywell Unit Ventilator Control team reacts fast to level the temperature changes common to high-occupancy areas such as classrooms. Its air stream thermostat responds to temperature changes before they reach room occupants.

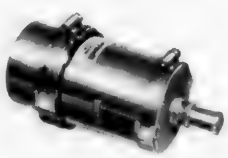
Developed especially for unit ventilators, this control team is ideal for year-round air conditioning using unit ventilators.

And year-round air conditioning can result in real savings for a school in the cost of construction, real benefits in increased teacher and student efficiency. It also brings the community a public building which can be used year-round, providing more useability for every building dollar.

For more information about the Honeywell Unit Ventilator Team or about the Economic Benefits of Air Conditioning for Schools, write Minneapolis-Honeywell, Dept. HV-3-50, Minneapolis 8, Minn.



M5016 Damper Motor controls unit ventilator damper. Diaphragm construction reduces friction, provides smooth positioning, aids modulating action of the entire Honeywell control team.



M0903 Piston Motor regulates Unit Ventilator coil bypass damper in accordance with summer or winter demands. Direct drive gives smooth modulation throughout damper travel.

L0907 Air Stream Thermostat has fast response, fewer moving parts. Working with room thermostat it resets the air temperature delivered by the ventilator, helps provide constant, even temperature.

T0913A Summer-Winter Pneumatic Round gives exact temperature reading, delivers exact temperature set. Responds instantly. Precise, rugged, tamperproof, easy to install, see and set.

Your choice of design in Honeywell's New Electronic Air Cleaner Line!

This Selector Series of Electronic Air Cleaners now offers you a choice of three cell designs to match exact job requirements.

Hi Velocity Cell ¼ inch plate interval. Provides air cleaning efficiency of 95 per cent at an air velocity of 700 fpm. Specify when maximum cleaning is desired, when high velocities are encountered, or where installation space is limited.

AC/ME Cell 5/16 inch plate interval. Offers advanced capacity for dirt loading and maximum cleaning efficiency at moderate air flow rates. Ninety per cent efficient at 600 fpm.

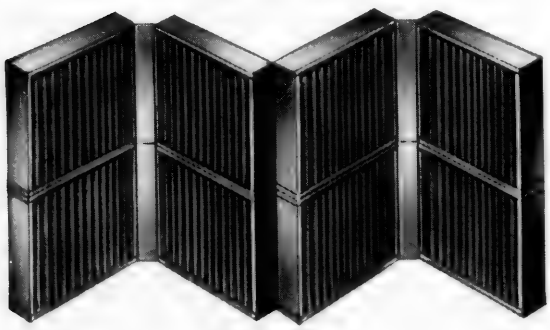
Hi-Load Cell ⅜ inch plate interval. Provides greater capacity for dirt loading, less frequent washing. 90 per cent efficient at 420 fpm.

Six times more efficient than mechanical filters, Honeywell Electronic Air Cleaners eliminate airborne dirt from the air conditioning system, trapping particles even as small as .001 microns.

A completely new washer has pliable nozzles that flutter as the water passes through giving faster, more efficient washing.

All Honeywell Electronic Air Cleaners are designed in building block modules. The frame is eliminated on field assembled units and simple button-type connectors replace the old electrical connections. They offer the simplest, quickest installation available, will fit an air conditioning system of any size.

For the ultimate in pure air, specify Honeywell Activated Charcoal Filters with your Electronic Air Cleaner

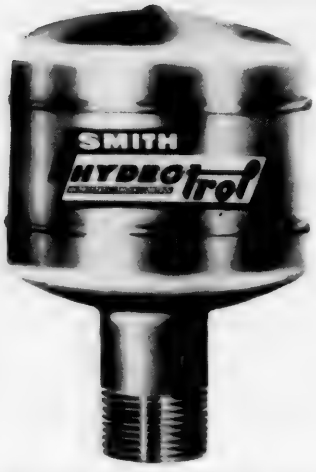


Add Honeywell Activated Charcoal Filters to your Electronic Air Cleaner and you have the finest air cleaning system available. The Electronic Air Cleaner removes the dirt. The Activated Charcoal Filters remove the odors. And they help each other do a better job. For instance, the Electronic Air Cleaner, by removing dirt efficiently, prevents the charcoal filter pores from becoming clogged. They last longer without reactivation, work better.

Activated Charcoal Filters pay for themselves in reduced air conditioning costs because they reduce the amount of outdoor air required to dilute odor. And with Honeywell's new V-shaped arrangement of building block modules, more charcoal filters can be put into the air stream without sacrificing easy access for reactivation.

For more information about Honeywell Electronic Air Cleaners or Activated Charcoal Filters, call your local Honeywell office. Or write Honeywell, Dept. HV-3-50, Minneapolis 8, Minnesota.

SMITH®
HYDROtrol
HYDROSTATIC SHOCK CONTROL



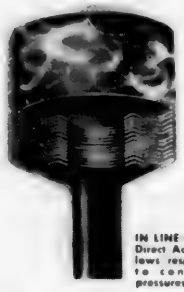
CONTROLS
HYDROSTATIC
SHOCK

CONTROLS PRESSURE WITH PRESSURE

Hydro-Trol's Pressurized Design using Pneumatic and Hydraulic Pressure to control Hydrostatic Pressure . . . provides a more effective and efficient way to control Hydrostatic Shock and eliminate water hammer in any hot or cold water piping system.

PRESSURIZED DESIGN

STOPS
PIPING
KNOCK



NITROGEN PRESSURIZED COMPRESSION CHAMBER
Controls bellows expansion under normal water line pressure so that full expansion capacity is available to control shock

HYDRAULIC FLUID

STAINLESS STEEL BELLOWS

IN LINE DESIGN
Direct Action Type Bellows respond instantly to control shock pressures

PNEUMATIC PRESSURE
As shock occurs, bellows expand creating a pneumatic pressure cushion which absorbs and controls shock

HYDRAULIC PRESSURE
Controls bellows alignment and cushions bellows contraction to control shock wave bounce

BALANCED BELLOWS
Constructed to insure each convolution expanding evenly and equally providing maximum displacement for dissipating shock pressures into pneumatic cushion

Built to withstand and control the extreme pressures of Hydrostatic Shock, the bellows are pneumatically and hydraulically controlled and cushioned against metal to metal contact, shock, stress, or strain . . . ever causing metal fatigue and bellows failure.

Using no rubber or synthetic compressables, Hydro-Trol's all stainless steel internal construction is unaffected by temperatures and time. Factory sealed, and permanently pressurized, Hydro-Trol more efficiently and effectively controls Hydrostatic Shock and may be counted upon to last the "Life of the Piping System."

SIX SIZES
Meets the requirements of every hot or cold water distribution system.

COMPACT IN SIZE
Installs in small pipe chase spaces.

LIGHTER IN WEIGHT
Requires no supporting devices.

SIMPLIFIED SIZING
Hydro-Trol makes sizing simple and easy.

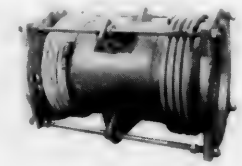
JAY R. SMITH MFG. CO.
Union, New Jersey
PLUMB-EASY

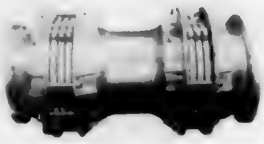
FOR FURTHER INFORMATION WRITE FOR YOUR COPY OF "SHOCK CONTOL BY HYDRO-TROL"

(Concluded from page 114)

Universal Expansion Joints

A new line of bellows-type expansion joints that accommodate pipe movement in any direction is announced by Zallea Brothers, Wilmington, Del. Known as Zallea universal expansion joints, these packless, corrugated-bellows units protect power and process piping systems by absorbing the following types of displacement—axial movement, lateral deflection, and angular rotation, either singly, or in any combination. They have the important advantage of absorbing unlimited amounts of lateral deflection without imposing any pressure thrust on piping or equipment, thus eliminating the need for heavy structural anchors.





Basic elements of these units include two hydraulically-formed bellows, a center section of pipe and appropriate tie rods. They are manufactured in standard sizes from 3 to 72 inches diameter and, depending upon pressure and temperatures to be encountered, are supplied with one of three different types of bellows—non equalizing, self equalizing or HyPTor torodial.

Standard units are available to pressures up to 2500 psi and temperatures from minus 320 deg F to plus 1600 deg. Special units are available for more severe conditions. At top in photo is a universal expansion joint with non-equalizing bellows and over-all tie rods; below is a universal expansion joint with self-equalizing bellows and over-the-bellows tie rods.

More information? Circle Item 65, postcard, last page.

Two-Stage Ignition System

As a feature available with larger burners, The Nu-Way Corp., Rock Island, Ill., offers a simple but effective 2-stage firing system employing only familiar components. The system, termed D-Lay-Flo by the manufacturer, greatly reduces the possibility of "hard starts" on burners using light oil at input rates to 40 gph, by admitting only two-thirds of the oil flow during initial firing. A separate oil line, supplying two nozzles, delivers this portion of the oil. When flame is well established, after approximately 15 seconds, a photoelectric cell triggers a valve on an extension of the oil line which feeds a third nozzle. Burner then operates at set capacity.

Due to the careful design and balance of air handling parts and nozzle ratings, modulation of air input during starting is unnecessary. Special safety timing and prepurge, post-purge requirements can be met with the inclusion of appropriate relays, according to the company.

More information? Circle Item 66, postcard, last page.

New Bulletins

TYPE "CCVS" No. 21-C
TYPE "HS" No. 14-B

Mechanical Shaft-Seal

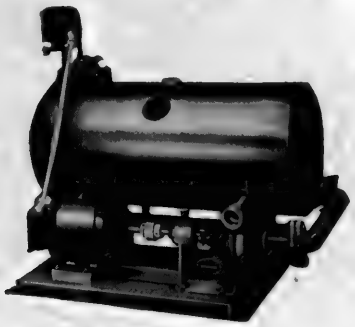
close-coupled design

TYPE "CCVS" PUMP

Capacities for the new CCVS Pump range from 500 to 10,000 sq. ft. E.D.R., and receivers from 5 to 20 gallon. Complete data on request.

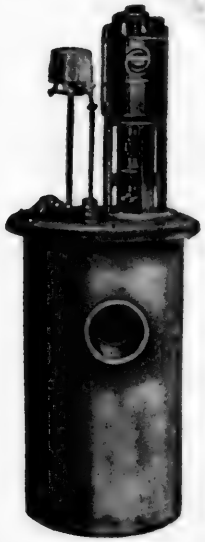
More Capacity!

More Performance!



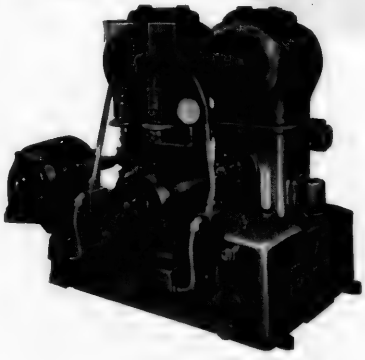
TYPE "HS" PUMP

The HS Pump offers more capacity and performance. Ranging from 1,000 to 125,000 sq. ft. E.D.R. Send for Bulletin.

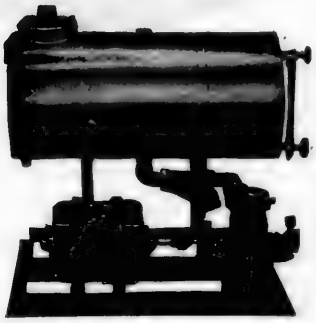


TYPE "UV" PUMP
Write for Bulletin No. 19-A

MAINTAINED SKIDMORE PUMPS EFFICIENCY



VACUUM PUMP
Write for Bulletin No. 9-B



TYPE "TM" PUMP
Write for Bulletin No. 17

SKIDMORE PUMPS

SKIDMORE CORPORATION ST. JOSEPH MICHIGAN

DEGREE-DAYS FOR JANUARY, 1959

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

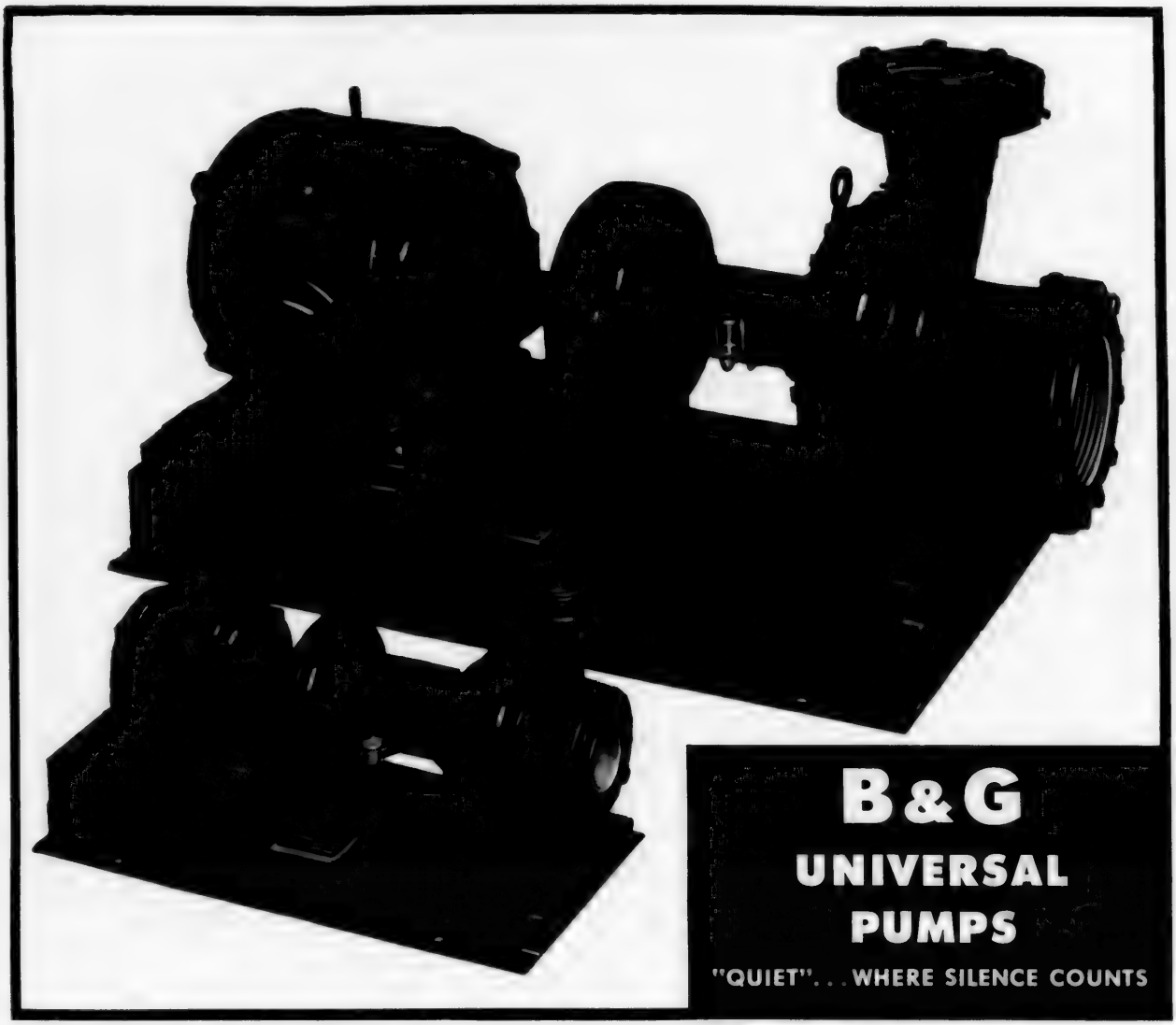
AIR CONDITIONING, HEATING AND VENTILATING's 31st Year of Publication of Monthly Degree-Day Data

City	January			Season to Jan. 31, incl., from Sept. 1		
	1959	1958	Normal	1958-59	1957-58	Normal
Abilene, Texas (A)	689	642	673	1837	1742	1771
Albany, New York (A)	1354	1323	1318	4155	3597	3877
Albuquerque, New Mexico (A)	948	914	970	2516	2743	2727
Alpena, Michigan (C)	1509	1313	1358	4412	4058	4185
Asheville, North Carolina (C)	867	1010	794	3509	2708	2427
Atlanta, Georgia (A)	711	801	632	1777	1939	1757
Atlantic City, New Jersey (A)	1034	962	905	3039	2386	2502
Augusta, Georgia (A)	611	739	521	1652	1738	1356
Baltimore, Maryland (C)	927	863	880	2628	2256	2417
Billings, Montana (A)	1297	913	1305	3827	3496	4044
Binghamton, New York (C)	1280	1245	1218	3976	3475	3635
Birmingham, Alabama (A)	696	788	623	1833	1893	1751
Bismarck, North Dakota (A)	1914	1444	1730	5321	4582	5188
Block Island, Rhode Island (A)	1050	974	1026	3110	2562	2962
Boise, Idaho (A)	896	1032	1169	2943	3357	3509
Boston, Massachusetts (A)	1118	1046	1113	3325	2715	3121
Buffalo, New York (A)	1317	1231	1225	3842	3474	3649
Burlington, Iowa (A)	1471	1253	1271	3794	3510	3605
Burlington, Vermont (A)	1479	1404	1460	4626	3932	4319
Cairo, Illinois (C)	945	934	856	2488	2296	2321
Charleston, South Carolina (C)	526	626	445	1208	1302	1103
Charlotte, North Carolina (A)	741	849	704	2035	2087	1978
Chattanooga, Tennessee (A)	829	876	725	2233	2250	2105
Cheyenne, Wyoming (A)	1194	1081	1225	3765	3890	4065
Chicago, Illinois (A)	1437	1192	1243	3733	3355	3595
Cincinnati, Ohio (C)	1013	1007	942	2787	2595	2653
Cleveland, Ohio (A)	1261	1137	1132	3559	3184	3303
Columbia, Missouri (A)	1246	1069	1091	3099	2921	3058
Columbia, South Carolina (A)	630	766	538	1732	1759	1446
Columbus, Ohio (C)	1178	1096	1051	3387	3013	3046
Concord, New Hampshire (A)	1353	1269	1392	4349	3622	4231
Concordia, Kansas (C)	1278	1050	1144	3216	3025	3192
Dallas, Texas (A)	664	584	607	1601	1445	1477
Dayton, Ohio (A)	(a)	1170	1094	(a)	3228	3216
Denver, Colorado (A)	1081	986	1125	3151	3167	3473
Des Moines, Iowa (A)	1503	1238	1330	3872	3695	3785
Detroit, Michigan (A)	1349	1182	1203	3740	3409	3528
Devils Lake, North Dakota (C)	2050	1546	1866	5816	5103	5661
Dodge City, Kansas (A)	1189	948	1076	3103	2844	3027
Dubuque, Iowa (A)	1631	1372	1414	4405	4084	4179
Duluth, Minnesota (C)	1937	1513	1696	5697	5098	5229
Elkins, West Virginia (A)	1126	1206	1017	3586	3449	3272
El Paso, Texas (A)	523	677	670	1451	1850	1756
Ely, Nevada (A)	1115	1153	1302	3736	4191	4166
Escanaba, Michigan (C)	1662	1324	1473	4730	4304	4529
Evansville, Indiana (A)	1048	1016	939	2975	2719	2654
Fargo, North Dakota (A)	1903	1470	1795	5309	4729	5333
Fort Smith, Arkansas (A)	864	809	775	2205	2027	2048
Fort Wayne, Indiana (A)	1353	1204	1200	3859	3507	3565
Fort Worth, Texas (A)	690	615	622	1678	1571	1512
Fresno, California (A)	488	568	629	1294	1637	1640
Galveston, Texas (C)	418	401	356	894	770	758
Grand Junction, Colorado (A)	1096	1084	1271	3061	3365	3564
Grand Rapids, Michigan (A)	1462	1290	1287	4082	3828	3879
Green Bay, Wisconsin (A)	1741	1402	1516	4771	4395	4551
Greensboro, North Carolina (A)	860	946	806	2470	2463	2319
Greenville, South Carolina (A)	723	847	673	1909	2105	1873
Harrisburg, Pennsylvania (A)	1095	1070	1051	3266	2970	3022
Hartford, Connecticut (A)	1186	1209	1178	3729	3228	3444
Havre, Montana (C)	1686	1062	1513	4753	3904	4753
Helena, Montana (A)	1367	1129	1469	4462	4105	4716
Houston, Texas (C)	(a)	406	378	(a)	857	843
Huron, South Dakota (A)	1738	1296	1597	4676	4056	4600
Indianapolis, Indiana (A)	1239	1136	1122	3531	3250	3263
Jackson, Mississippi (A)	633	707	535	1654	1623	1417
Kansas City, Missouri (A)	1187	1020	1085	2859	2785	2960
Knoxville, Tennessee (A)	854	902	760	2286	2265	2214
La Crosse, Wisconsin (A)	1694	1351	1528	4494	4144	4428
Lander, Wyoming (A)	1373	1258	1494	4235	4410	4803
Lewiston, Maine (O)	1343	1219	1452	4366	3696	4289

(a) Data not available.

Normal figures in this table are based on 30-year period covering 1921 to 1950, inclusive, as compiled and published by the U. S. Weather Bureau.

Figures in this table, with two exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively. [Table concluded on page 122]



B&G
UNIVERSAL
PUMPS
"QUIET"... WHERE SILENCE COUNTS

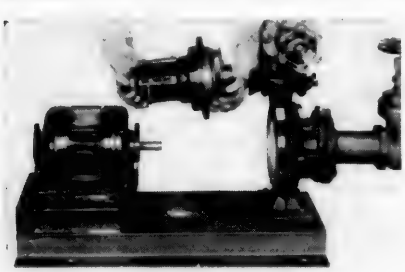
QUIET... FROM 1 TO 40 H.P.

With the line of B&G Universal Pumps now covering a range of from one to forty horsepower, every conceivable circulation requirement of systems using water for heating and cooling can be satisfied.

The B&G Universal Pump is an outstanding example of a product designed to meet a specific need. It is engineered and built to satisfy in every detail the exacting demands of circulated water systems, *Silent, vibrationless operation* is the keynote of the Universal's performance.

Motors are specially constructed and selected for *extra-quietness!* Long *sleeve* bearings are used in both motor and pump and the oversized shaft is made of special alloy steel with an integral, heat treated thrust collar. Water leakage is prevented by the exclusive diamond-hard "Remite" mechanical seal. Flanges, bolts, nuts and gaskets for both suction and discharge sides and pet cocks for venting and gauge tappings are furnished without extra charge.

Send for descriptive literature and engineering data.



Easy to service... vertical split case construction permits removal of entire bearing frame without disconnecting pipes.

Reg. U.S. Pat. Off.

BELL & GOSSETT
COMPANY
Dept. FQ-4, Morton Grove, Illinois
Canadian Licensee: S.A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto 16, Ontario

Degree-Days for January, 1959 (Concluded)

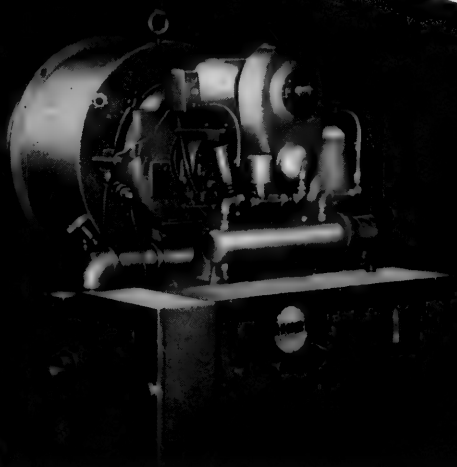
(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING's 31st Year of Publication of Monthly Degree-Day Data

City	January			Season to Jan. 31, incl., from Sept. 1		
	1959	1958	Normal	1958-59	1957-58	Normal
Lincoln, Nebraska (C)	1331	1128	1240	3372	3269	3483
Little Rock, Arkansas (A)	776	753	719	1970	1782	1898
Los Angeles, California (C)	155	160	328	369	419	779
Louisville, Kentucky (A)	1001	999	933	2785	2626	2666
Lynchburg, Virginia (A)	891	969	846	2599	2615	2471
Macon, Georgia (A)	565	689	497	1406	1545	1321
Madison, Wisconsin (A)	1684	1360	1417	4505	4117	4124
Marquette, Michigan (C)	1617	1292	1435	4612	4218	4446
Memphis, Tennessee (A)	780	844	725	2069	1974	1973
Meridian, Mississippi (A)	750	739	561	1744	1662	1517
Milwaukee, Wisconsin (A)	1594	1330	1336	1272	3961	3947
Minneapolis, Minnesota (A)	1686	1311	1562	4554	4184	4552
Moline, Illinois (A)	1523	1319	1296	3909	3711	3722
Montgomery, Alabama (A)	573	692	517	1416	1546	1381
Nashville, Tennessee (A)	861	911	778	2370	2298	2150
New Haven, Connecticut (A)	1124	1094	1113	3403	2949	3258
New Orleans, Louisiana (C)	421	465	341	898	901	770
New York, New York (C)	1031	1014	995	2931	2542	2766
Newark, New Jersey	1036	1025	1039	3019	2659	2951
Norfolk, Virginia (A)	777	852	729	2053	1962	1986
North Platte, Nebraska (A)	1292	1175	1271	3851	3610	3835
Oak Ridge, Tennessee (C)	894	901	834	2433	2272	2421
Oakland, California (A)	415	455	552	1127	1393	1629
Oklahoma City, Oklahoma (A)	983	789	843	2444	2272	2210
Omaha, Nebraska (A)	1431	1181	1302	3617	3425	3670
Parkersburg, West Virginia (C)	1078	1068	949	3106	2878	2773
Peoria, Illinois (A)	1435	1233	1240	3729	3418	3552
Philadelphia, Pennsylvania (C)	963	971	933	2814	2458	2557
Phoenix, Arizona (A)	341	365	425	740	933	980
Pittsburgh, Pennsylvania (C)	1116	1074	992	3211	2908	2882
Pittsfield, Massachusetts (A)	1381	1349	1358	4396	3871	4203
Pocatello, Idaho (A)	1106	1297	1333	3505	4083	4060
Portland, Maine (A)	1349	1183	1373	4379	3542	4149
Portland, Oregon (C)	677	588	791	2016	2059	791
Providence, Rhode Island (A)	1134	1057	1125	3478	2911	3320
Pueblo, Colorado (A)	1143	1002	1104	3131	3029	3383
Raleigh, North Carolina (A)	786	893	691	2246	2242	1857
Rapid City, South Dakota (A)	1374	1019	1361	3907	3561	4163
Reading, Pennsylvania (C)	1045	1028	1017	3115	2773	2883
Red Bluff, California (A)	507	580	617	1185	1760	1559
Reno, Nevada (A)	875	943	1048	3028	3376	3386
Richmond, Virginia (A)	847	936	828	2465	2411	2360
Rochester, New York (A)	1326	1268	1249	3938	3572	3722
Roswell, New Mexico (A)	789	783	787	2268	2271	2202
Sacramento, California (C)	451	554	614	1107	1598	1594
St. Joseph, Missouri (A)	1339	1134	1017	3326	3191	2826
St. Louis, Missouri (C)	1146	1001	983	2838	2608	2686
Salt Lake City, Utah (A)	956	1053	1194	3037	3435	3473
San Antonio, Texas (A)	497	453	462	1194	1086	1062
San Diego, California (A)	156	170	317	358	421	795
Sandusky, Ohio (C)	1283	1180	1122	3586	3252	3238
San Francisco, California (C)	333	373	462	913	1162	1343
Sault Ste. Marie, Michigan (A)	1665	1477	1587	5082	4553	4927
Savannah, Georgia (A)	537	644	424	1282	1405	1099
Scranton, Pennsylvania (A)	1243	1222	1141	3890	3491	3395
Seattle, Washington (C)	684	574	753	2168	2079	2435
Sheridan, Wyoming (A)	1397	1034	1392	4240	3815	4437
Shreveport, Louisiana (A)	609	616	550	1576	1425	1398
Sioux City, Iowa (A)	1539	1258	1423	4051	3722	4131
Spokane, Washington (A)	1111	1015	1243	3661	3533	3948
Springfield, Illinois (A)	1309	1119	1116	3433	3178	3114
Springfield, Missouri (A)	1094	970	1001	2867	2656	2834
Syracuse, New York (A)	1357	1345	1225	4032	3567	3565
Toledo, Ohio (A)	1359	1210	1197	3878	3511	3561
Topeka, Kansas (C)	1265	1023	669	3189	2846	2979
Trenton, New Jersey (C)	1027	1027	1004	3055	2685	2856
Tulsa, Oklahoma (A)	960	803	856	2322	2130	2238
Utica, New York (O)	1361	1324	1248	4127	3632	3785
Valentine, Nebraska (A)	1409	1157	1361	4115	3749	4070
Walla Walla, Washington (C)	855	766	1023	2689	2623	2989
Washington, D. C. (C)	923	946	884	2592	2476	2488
Wichita, Kansas (A)	1187	931	1023	2902	2733	2786
Williston, North Dakota (C)	1839	1320	1705	5195	4454	5200
Winnemucca, Nevada (A)	936	1023	1153	3276	3720	3748
Yakima, Washington (A)	1047	924	1181	3476	3286	3650

For footnotes, see page 120.

NEW LOW COST PACKAGED FORCED DRAFT BURNERS



40 to 90 Horsepower units added to RAY Line

COMPACTLY CONSTRUCTED

FULLY AUTOMATIC

INSTANT FUEL CHANGEOVER

LIGHT OR HEAVY OIL OPERATION

ELECTRONIC CONTROLS

These factory assembled units are ready for application as complete combustion systems to multiple pass Scotch Marine, Water Tube and Firebox boilers and to other types of heat receivers designed for pressurized operation.

Send for complete technical data bulletin Y-1

RAY BURNER COMPANY

1301 San Jose Avenue, San Francisco, California

629 Grove Street, Jersey City, New Jersey

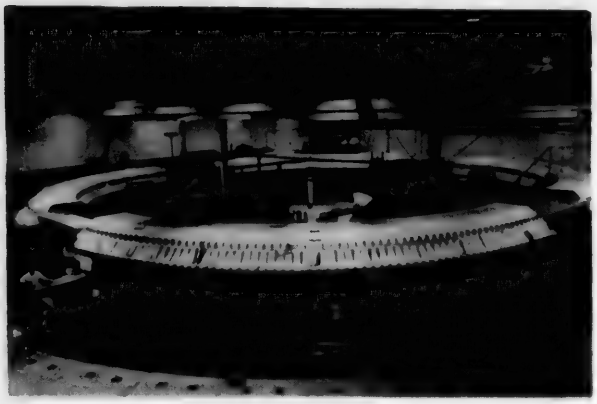
"BALANCE" BUILDING

PRODUCT APPLICATIONS

New, Unusual, or Ingenious Uses of Equipment and Materials

Chilled Water Cools the Cosmotron Through Magnet's Coil Windings

Holding protons up to energies of three billion electron volts calls for a quick, sure way to cool the magnetic holding force. This force, produced by a 2000-ton electromagnet at Brookhaven National Laboratory, Upton, N. Y., literally spins protons around a 75-ft orbital path at the rate of three million times per second. The giant particle accelerator, called the Cosmotron, holds protons



on an even course while a radio frequency amplifier adds 1000 volts to the energy of the protons each time they circle the accelerator.

To cool the giant electromagnet, scientists designed a system to flow demineralized water at 500 gpm through the copper windings of the magnet coils. At the heart of the system is a Patterson-Kelley water chiller capable of supplying 100 tons of refrigeration. The 48-turn windings are fabricated from 50-ft lengths to $\frac{3}{4}$ x $1\frac{7}{8}$-inch copper bars, with each turn have a $\frac{3}{8}$-inch internal cooling hole along its axis. The turns, electrically in series, are water cooled in parallel.

The Cosmotron is divided into quadrants, with each section containing 72 steel magnets. At the end of each quadrant, a copper manifold with 96 outlets connects the water system to the coil end of the conductors to form a separate cooling system for each section.

Flow meters in the water line for each conductor are arranged to give warning signals for any flow failure, and inlet-outlet temperatures of each quadrant are measured and metered. The two-circuit chiller further safeguards the cooling system. If one circuit becomes plugged, the other circuit remains in operation to supply cooling water.

Multiple Corrosion Problems Solved By One Chemical Product

A single chemical product is protecting 2560 tons of air conditioning equipment against corrosion attack at the 525 William Penn Place Building, Pittsburgh, Pa.

This 42-story addition to Pittsburgh's skyline contains 13,500,000 cu ft of office space, and is conditioned by 4 hot and chilled water circulating systems utilizing steel risers, copper runouts, and brass valves. Each of these metals presents a separate corrosion problem, and each is being treated by a single chemical—Corrosion Inhibitor CS—developed by Hagan Chemicals, Inc., of Pittsburgh.

Treatment with Corrosion Inhibitor CS was started four years ago. Since that time maintenance and replacement problems to the closed circuit portions of the air conditioning equipment have been non-existent.

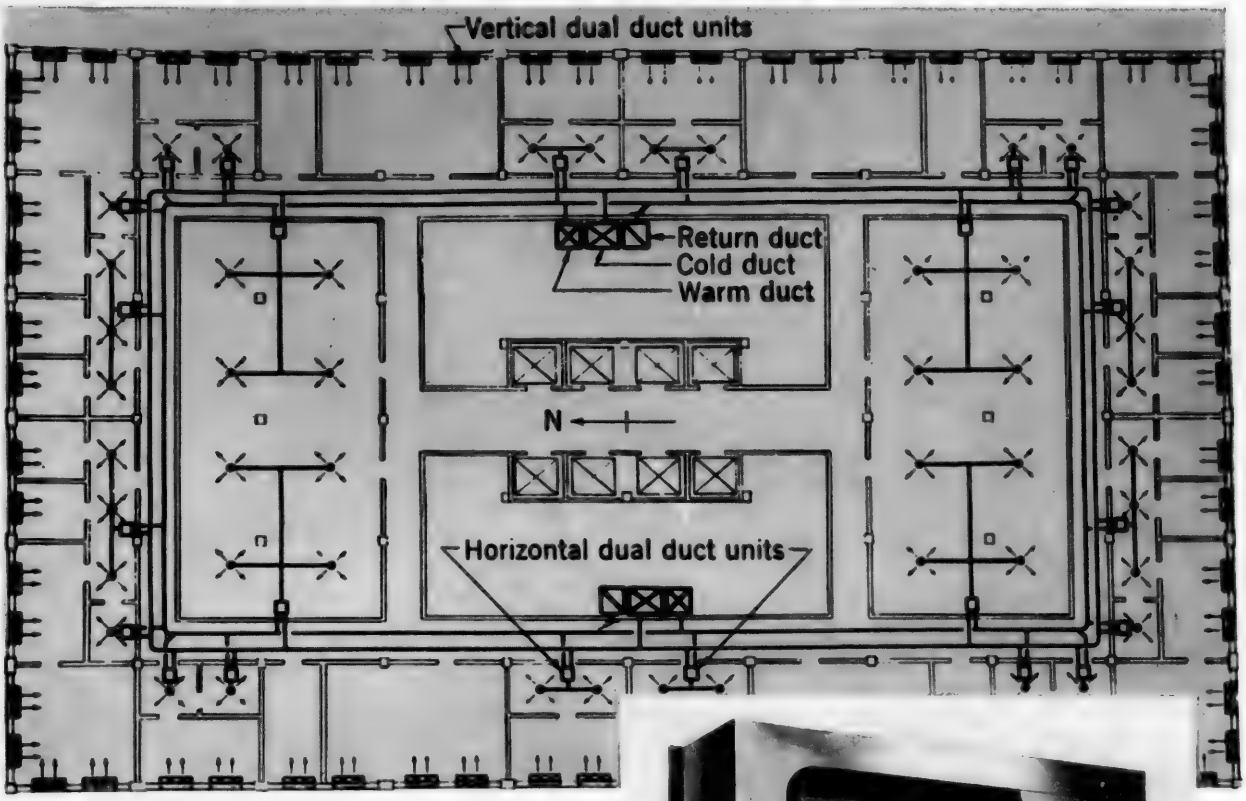
Heating, Air Conditioning Equipment Requires 24-Story Lift

Two 18-ton boilers were part of a 200-ton heating and air conditioning load recently lifted to the roof of the 24-story, curtain-walled East Ohio Gas Company building in Cleveland, Ohio. The job was done by George Young Co., of Philadelphia, Pa., with an American 1336-80 derrick powered with a Model 140 diesel torque convertor 2-drum hoist with swinger.

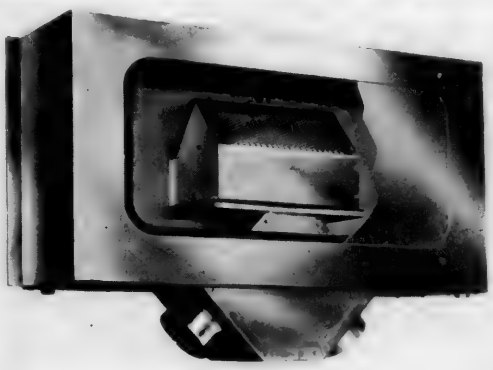
When the boiler shown completed its 24-story ride, it was swung horizontally 110 ft back to a hatch in the roof, then lowered into place. The general contractor, Tishman Realty and Construction Co., New York City, cast anchor bolts into the column and slab to secure the step and sills of the derrick to the roof slab. A six-part line was used for the lift which took six minutes for each boiler. A 55-ft reach was required to clear the building, and the load had to be swung another 55 ft behind the point of anchorage of the derrick to reach the hatchway in the roof.

NEWS OF THE MONTH

HOW TO BALANCE A BUILDING BEFORE IT'S BUILT:



Shown above is a typical office building dual duct layout, 100 per cent air system. It is zoned to provide selective temperature control for each enclosure with Buensod vertical dual duct units at exterior walls. These under-window units may be connected to vertical risers, or to horizontal mains at the ceiling or on the floor below.



Illustrated: Buensod Type V window-wall unit with cut-away showing automatic volume control. This unit is designed for installation under windows to discharge vertically upward, quietly and without draft.

Balancing a building before it's built . . . almost an incongruity, yet Buensod does it consistently. Buensod air mixing units can be pre-set at the factory for desired volume and guaranteed within ±5% when installed. Whenever desired, a change in air volume may be made in the field by simple adjustment of one nut. This practically eliminates the tedious job of balancing after installation . . . a chore which can take months.

The secret is in Buensod's proven Automatic Volume Control. A simple tent-like apparatus maintains constant air quantity from each unit regardless of variance of static pressures on either inlet or outlet of mixing valve. This operates automatically . . . independent of any outside power source, sensing instrument or complicated linkage arrangement. The mixing valve is actuated by a local thermostat to provide the desired room temperature.

Buensod units are being designed into a constantly increasing number of new and renovated structures. Consider them for your next project.

BUENSOD DUAL-DUCT

Write for details to: BUENSOD-STACEY INC. Buensod-Stacey, Inc., 45 West 18 Street, New York 11, New York

...economical G. I. type

COOLING LOAD COMPUTER

determines the capacity of air conditioning unit for any home. Used to train company salesmen.

How large an air conditioning unit is required by a seven-room ranch house, facing northwest, and shaded by a grove of oak trees? An electronic analog computer developed by engineers of Westinghouse Electric Corporation will analyze the facts about this dwelling and in 24 sec come up with the answers to its cooling needs. Called Warac, the computer has been exhibited for the first time at the 14th Heating and Air Conditioning Show in Philadelphia. The computer presents a new approach to determining and properly specifying how much air conditioning capacity is required in a particular house at a particular location, according to Raymond K. Serfass, manager of the Westinghouse air conditioning division in Staunton, Va. The company believes that electronic computation of this type will play an ever greater role in the air conditioning industry.

The company intends to use the computer for training its salesmen, distributors and dealers in determining the air conditioning needs of its customers. It does not plan to use it in calculating air conditioning requirements for the individual home owner at the present time, because its development has not yet progressed to the stage where this would be economically feasible, the company states.

• **APPLIES TO PROJECTS**—It is likely to find application in major housing projects, however, where many homes are basically similar in construction, but varied in design, size and juxtaposition. In addition, it presents a useful means of studying what kind of home construction is most economical from an air conditioning point of view.

Designed and developed at the Westinghouse new products engineering laboratories in Cheswick, Pa., at the request of the company's air conditioning division, its name, Warac, signifies Westinghouse Analog Recording Air Conditioning Computer. The unit is designed to consider systematically over 50 factors which influence the indoor temperature of a house. Information related to these factors is programmed into the machine through a set of dials and switches.

The principle behind the analog computer's operation is that voltage represents temperature, and current is equated to the flow or transfer of heat. Capacitors serve to denote the storage of heat energy; and resistors are comparable to thermal resistance. Four basic components make up the computer: the generator section, analog section, amplifier section, and recorder.

In the *generator* section of the computer, a knob is preset to indicate the effect of the sun's rays upon the house. In order to provide the computer with this information, the time of year and the latitude of the location must be known. Another dial is used to set the direction in which the house faces. A control for outdoor air temperature is also included in the computer's generator section.

In the *analog* section, factors taken into consideration include the type of structure of the house as represented by the windows, floors, walls, ceilings, and roof. Other variables accounted for are: amount of insulation, shading on the exterior walls, wind velocity, ventilation loads, average occupancy, and heat generating from cooking.

The *amplifier* section has controls to set up the exact area in square feet of walls, floors, ceiling and glass. A dial indicates the desired indoor temperature.

• **ACTUAL TEMPERATURES GIVEN**—Once all of these adjustments have been made the operator selects an air conditioning unit in terms of cooling capacity anywhere from 0 to 110,000 Btu's. Then a switch is set for either air-cooled or water-cooled unit ratings. A push of a button puts the computer into operation. In 24 sec its *recorder* feeds out a strip of tape containing a chart with a record of the actual outdoor and indoor temperatures for the house under consideration over a 24-hr period. This tape indicates exactly how an air conditioning unit will perform in cooling the home in question. And by varying the factors which have been set on the dials, much valuable information may be learned.

By turning up the dial which controls the occupancy of the house, for example, it can be ascertained what temperature the air conditioning unit will maintain while a number of guests are present for a party. It is also possible to determine what effects additional insulation would have upon the cooling requirements of a home. Such changes which are made in the dials on the computer are reflected on the tape from the recorder as it charts the temperature variations for a 24-hr period.

(News of the Month continued on page 144)

BOOK REVIEWS

Publications abstracted in this department

mental hospitals and motels, fixture roughing for low cost housing projects, distilled water systems, and such hard-to-find items as water and drainage facilities for

PACKAGED INDUSTRIAL FANS

...featuring flat radial blade wheels

A packaged industrial fan is now offered to cope with virtually any industrial air or material handling problem. Weather cover is removable, and motors and drives may be installed, removed, serviced or adjusted on the job by one man. All units are rotatable and reversible in the field. Available in wheel sizes from 14 inch thru 36 inch. Send for Bulletins 585 and 586.

For BIG performance

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Packaged industrial fans provide LS TYPE wheels as standard, but may be furnished with LM TYPE at slight additional cost. A completely redesigned line of industrial fans is also offered, with wheel sizes from 10 inch thru 78 inch.

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NEW AIR-CONDITIONING SYSTEM

should be ordered direct from publisher.

HANDBOOK OF AIR CONDITIONING, HEATING AND VENTILATING

A comprehensive, easy-to-follow handbook of information covering the fields of air conditioning, heating and ventilating, is the result of many years of preparation under the guidance of Clifford Strock, editor. Material by an imposing list of authorities is included.

Subject matter is divided into eight main sections: Air conditioning; air handling and ventilation; fuels and combustion; heating and heat transfer; piping and plumbing; motors and starters; mathematical data; terminology.

A few of the firsts claimed for this book are: Complete tables of heat losses from insulated pipe; heat losses by transmission and infiltration through every standard type and size of window; new data on steam flow in pipes; the most extensive collection of degree-day and climatic maps ever published for this field including design temperature, sun, snow, ground, water and seasonal data of many kinds.

Other notably complete data include psychrometric tables and charts for a wide range of temperatures and pressures; tables of heat losses from buildings; design of high velocity and dual duct systems; combustion data for all fuels; hourly and seasonal solar data specifically for engineers; design data for all standard pipe and tube, including plastic; a full 173-page section of mathematical tables, conversion factors and drafting symbols.

This handbook differs from other references in this field in that emphasis is entirely on working data. Therefore, tables, charts and solution of problems predominate. Text serves only to explain how data are applied.

According to Clifford Strock, editor of this handbook, its purpose is to provide engineers, contractors and others with the kind of information they need daily in their work, and to present it in the most convenient, time-saving manner possible.

Handbook of Air Conditioning, Heating and Ventilating, edited by Clifford Strock. Flexible fabricoid binding. 7¾ by 10¾ inches, 1112 pages. Published by The Industrial Press, 93 Worth St., New York 13, N. Y. Price $15; Canada and abroad, $17.

PLUMBING DESIGN

Specialized subjects such as confront the designer of plumbing system are covered in Design of Plumbing and Drainage Systems, by Louis Blendermann. The author, at present director of research and engineering of Jay R. Smith Manufacturing Company, draws upon more than 20 years of plumbing design experience. He has served as designer of plumbing systems for many of the large consulting engineering firms.

Not only are such basic problems as footing drains, dry wells, drainage piping and hot water supply covered thoroughly for conventional systems, but the book explores the whole field of modern specialized topics such as fire protection in tall buildings, water service and waste disposal for research laboratories, systems for animal quarters, draining the planting area, first aid fire protection, and handling volatile fluid wastes.

In forty-five chapters, profusely illustrated, this book offers not only a detailed guide to the young designer but a complete reference to the unusual for the experienced designer who meets a new problem.

Design of Plumbing and Drainage Systems, by L. Blendermann. Cloth bound, 328 pages, 6 x 9 inches. Published by The Industrial Press, 93 Worth St., New York 13. N. Y. Price, $7.

AIR CONDITIONING

A series of seven articles on servicing commercial and residential cooling equipment that appeared in Heating and Air Conditioning Contractor, has been developed into a book on Residential and Commercial Air Conditioning by Charles H. Burkhardt, national secretary, Distribution Division, Oil Heat Institute of America.

The text is practical in approach and its objective is to provide workable, how-to-do-it knowledge for the beginner and for the experienced air conditioning man.

Residential and Commercial Air Conditioning, by C. H. Burkhardt. Cloth bound, 6 x 9 inches, 324 pages. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. Price, $9.

Pollen Removal

(Concluded from page 66)

coating on the edges of the pleated media insures good contact with the electrodes. Efficiency with and without electrification was 99.3 and 97%, respectively.

It should be noted that although electrification appears to afford no significant improvement in pollen collection, other tests with atmospheric dust[7] have indicated that electrification may double the base efficiency of the media. Collector 50, a low voltage, two-stage electrostatic precipitator afforded 100% pollen removal according to our tests[2].

The three units described in Table 5 have been included in this paper since they are recommended as prefiltering devices. It should be noted that they cost more than the throw-away filters referred to in Tables 1 through 3 and are designed for use where the cleaning demands are more stringent.

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3. Drinker, P. and Wells, W. F.: A Method for Testing Filters Against Pollen, Bacteria, and Molds, *Heating Piping and Air Conditioning*, September, 1934, p. 408.
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7. Dennis, R., Silverman, L. et al: Air Cleaning Studies, Progress Report for July 1, 1954 to June 30, 1955, *USAEC Report No. NYO 4611*, Harvard University, October 15, 1956.

...and again it's Allen-Bradley Trouble Free Motor Control!

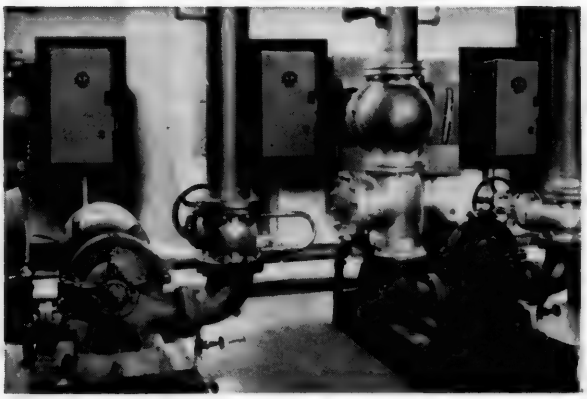
Basic Sciences Building
State University of New York Downstate Medical Center
Air Conditioning Contractor: Almirall & Co., Inc.
Engineers: Jaros, Baum & Bolles, Inc.

Consulting engineers—the men who *know* the importance of reliable performance—prefer to see Allen-Bradley motor control on *all* their jobs. Here's why: The simple solenoid design—exclusive with A-B in all starters up through Size 8—has only ONE moving part. This assures *years* of trouble free operation. A-B starters also have maintenance free, double break, silver alloy contacts and permanently accurate overload relays. All these features guarantee "user" satisfaction.

Allen-Bradley Co., 1330 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

ALLEN-BRADLEY
MOTOR CONTROL
QUALITY

A-B Bulletin 646 manual reduced voltage, autotransformer starter for a 7½ hp fan motor.



Three A-B Bulletin 646 manual reduced voltage autotransformer starters used with the 50 hp condenser water pump motors.

One of three A-B Bulletin 746 automatic reduced voltage autotransformer starters for the supply and exhaust fan motors.

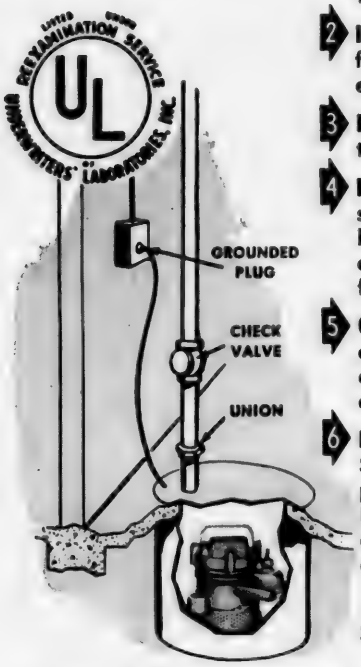
ONLY the Rich.

CAN AFFORD A CHEAP SUMP PUMP

A cheap sump pump means more servicing, more call backs, more customer dissatisfaction and its short life means early replacement. Only a RICH CONTRACTOR and a RICH CUSTOMER can afford to install a cheap pump.

YOU WANT A WEIL SUBMERSIBLE SUMP PUMP

because



1. **IT IS SAFE.** The complete unit is Underwriters Laboratories, Inc. tested and approved. Your guarantee of a SAFE INSTALLATION.
2. **IT IS QUIET.** Operation is in the pit, below floor level. (See diagram.) No radio interference from its heavy duty motor either.
3. **IT IS CLEAN.** The pump is submerged and the sump cover sealed. **NO DIRT, NO ODORS.**
4. **LOW MAINTENANCE COST.** The factory sealed and permanently lubricated unit, all ball bearing, ⅓ H.P. Capacitor motor with overload protection assures long, trouble-free life.
5. **GUARANTEED FOR ONE YEAR.** A real guarantee with prompt action. A defective pump can be taken to the jobber for immediate attention.
6. **DEPENDABILITY.** The Weil SUBMERSIBLE SUMP PUMP is the product of thirty years of pump engineering and testing. The Weil Pump Company has pioneered in the development of submersible sump pumps. You can depend upon this pump.

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make it – **ANOTHER HIDDEN VALUE** in your construction.

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NEW CATALOGS

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

HEATING, CONDITIONING LINES — Edwards Engineering Corp., Pompton Plains, N. J., has published a 4-page brochure on its complete line of Box-Fin baseboard radiation, industrial and commercial radiation, motorized zone control valves, Co-Axial refrigerant condensers, Zone-A-Matic packaged heating units, basic boilers and water heaters, Airvec refrigerant condensers, and finned tubing.

Circle **Item 67** on Inquiry Card

TO SPECIFY VIBRATION CONTROL — Vibration control specifications for air conditioning equipment is the subject of 4-page Bulletin F2C, published by The Korfund Co., Inc., Long Island City, N. Y. Included is a handy specification selector table which lists the various components of an air conditioning system, such as air conditioners, cooling towers, pumps, etc., with direct reference to appropriate specification paragraphs for either extremely critical, critical, or non-critical applications. Text explains how to use the table.

Circle **Item 68** on Inquiry Card

REFRIGERATION SPECIALTIES — The latest in its line of refrigeration valves, fittings, and supplies is described in a series of catalog pages published by Frick Company, Waynesboro, Pa. Prices of valves, either singly or complete with either screwed or welding-neck flanges, are arranged to save time in ordering. Pipe nipples, hanger fittings, and other new items have been added, while the whole catalog has been brought up to date. Eight pages of tables on refrigerants, brines, steel pipe, copper and steel tubes, storage temperatures, mechanical equivalents, and thermometer scales, will prove useful to the engineer.

Circle **Item 69** on Inquiry Card

IDEAS FOR MODERNIZATION—Fifty-nine ideas for plant modernization in '59 are suggested and explained in a 20-page booklet offered by Allis-Chalmers Manufacturing Co., Milwaukee, Wis. Among the ideas are the following: Save up to 60% on motor purchases; get more accurate variable speeds; reduce blowdown rate; clean out your electrical jungle; modernize industrial waste disposal; and save steam.

Circle **Item 70** on Inquiry Card

(Continued on page 132)

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HIGH VELOCITY AIR FILTERS

VIRO CRIMP MEDIA
has special Hemmed Edges for strength and safe, easy handling. No Cuts! No Scratches! No Filter surface damage.

AFI MEMBER AIR FILTER INSTITUTE

- MAXIMUM EFFICIENCY AT (300 — 600 FPM)
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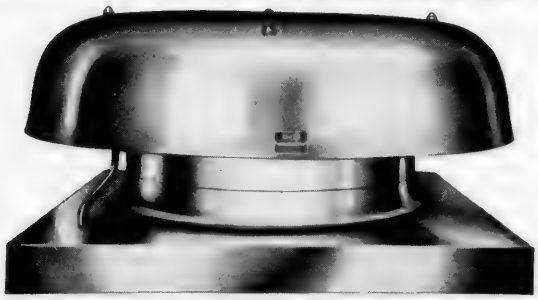
ROOF VENTILATOR



Model QD—from 1200 to 38,350 CFM

Shipped completely assembled, with integral conduit to facilitate wiring, Direct drive fan has individually cast aluminum hub and blades. Blades are replaceable. Serviced from above the roof line. Extremely lightweight for size—38,350 cfm. unit weighs only 485 lbs. crated for shipping. Venturi type base and one-piece top cap are spun aluminum.

A complete line of spun aluminum centrifugal ventilators, belt and direct drive, is also available.

Write for catalog and free booklet
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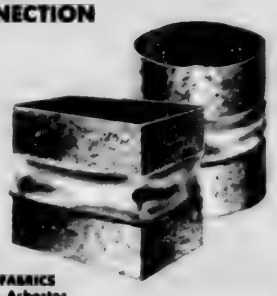
COIL OF PROFIT
PRE-FAB-RIC

A PREFABRICATED FLEXIBLE DUCT CONNECTION

Simply pull out desired length from dispenser-type carton. (It pulls out ready to use.)
Roll into round duct or form into square duct and join. Saves 70% time over old methods.
DOUBLE-SAFE-LOCKED



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Commercial - Economy
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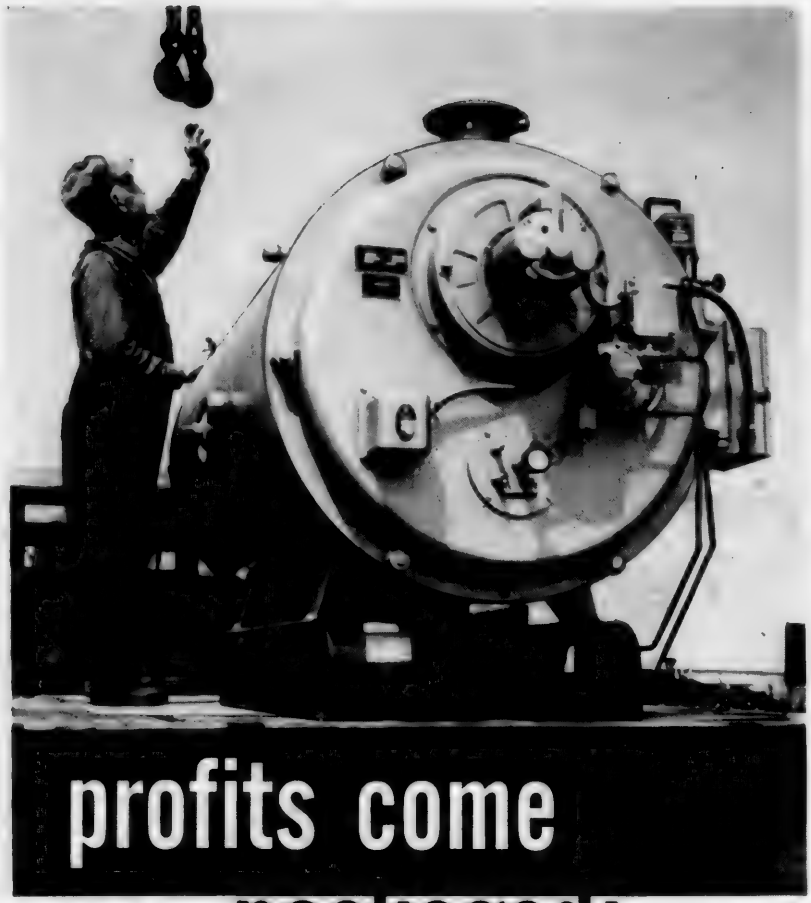
THREE FABRICS
Canvas - Asbestos
Neoprene

Union Made

SOLD ONLY THROUGH JOBBERS AND DISTRIBUTORS
Some Territories Open for Manufacturers' Agents Calling on Jobbers and Distributors
CAIN MANUFACTURING CO.
1111 North 5th Avenue Phone FA 2-0354 Birmingham, Alabama



profits come packaged:

Cleaver-Brooks Progress boilers pay off in time and labor savings

PROGRESS BOILER PROVES good things come in a *complete* package — especially when it comes to boilers. No need for you to do the manufacturer's work. No costly time-waste, boiler-building on the job!

Because Progress is a completely pre-engineered, factory-tested package — ready for hook-up to service lines — you save up to two days on installation alone.

PROFITS PROVE THE PACKAGE And when it comes to worry-free installation, Cleaver-Brooks leaves nothing undone. Field starting service is just one example. A Cleaver-Brooks technician starts the boiler, trains the boiler attendant at no extra cost.

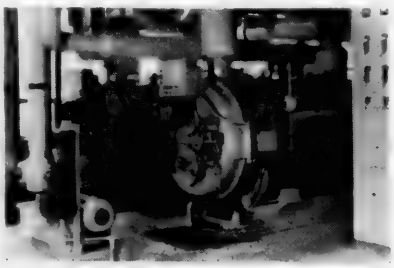
And Progress is easy to sell with quiet, low-cost operation. Four-pass, forced draft design means guaranteed efficiency; electronic controls, soft flame start.

Cleaver Brooks®

TO MAKE PROGRESS SELL PROGRESS

The Progress boiler is built to the standards of industrial boilers. Available in 7 sizes to 2,010,000 Btu — oil, gas or combination oil/gas fired models.

You'll profit as a Progress contractor. For your Progress *Cooperative Wholesaler* contact your local Cleaver-Brooks sales representative listed in the yellow pages, or write Cleaver-Brooks Company, Dept. L, 327 E. Keefe Ave, Milwaukee 12, Wisconsin.



Cleaver-Brooks boilers are available in 19 sizes, 130 models, 15 to 600 hp. — steam or hot water, gas, oil or combination oil/gas fired. Illustration shows Model CB boiler as installed at Whirlpool Corp., St. Joseph, Michigan.

NEW CATALOGS

(Continued from page 130)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

SEAMLESS COPPER TUBING—A brochure, entitled The Measure of Tubemanship, is published by Wolverine Tube Division of Calumet & Hecla, Inc., Allen Park, Mich. Its aim is to further acquaint industry with the combination of skills and techniques that are necessary to the manufacture of seamless copper and copper alloy tubing.

Circle **Item 71** on Inquiry Card

ZONE CONTROL CABINETS— Air conditioning zone control cabinets are described in 20-page Bulletin 4C-220, published by Buffalo Forge Co., Buffalo, N. Y. Separate sections with tables, curves and sketches cover proper unit selection, physical data, dimensions, fan performance, and coil ratings for water cooling, direct expansion, hot water and steam.

Circle **Item 72** on Inquiry Card

SNOW MELTING SYSTEMS—An informative 32-page brochure about steel pipe snow melting and ice removal systems is available from Committee on Steel Pipe Research, American Iron and Steel Institute, New York, N. Y. It includes discussion, tables, photos, and diagrams on advantages, design, installation, and maintenance of these systems.

Circle **Item 73** on Inquiry Card

MULTI-ZONE AIR CONDITIONERS — Description, performance data, specifications and dimensions are included in Catalog No. 383A covering multi-zone air conditioners manufactured by Acme Industries, Inc., Jackson, Mich. Units range in size from 4060 to 19,200 cfm, and provide heating, cooling, ventilating, filtering, humidifying and dehumidifying of air for as many as 16 zones.

Circle **Item 74** on Inquiry Card

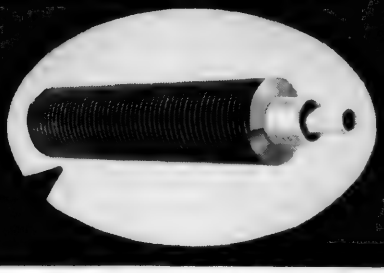
BRASS MILL LEXICON— Copper and Copper Alloy Metalexicon is a 24-page, illustrated, handy booklet offered by The American Brass Co., Waterbury, Conn., and designed to help untangle the complex terminology applied to brass mill products. Definitions of such terms as *deoxidized, flat wire, patent leveling, season cracking, resquared metal, elongation,* and *yield strength* are among the hundreds provided.

Circle **Item 75** on Inquiry Card

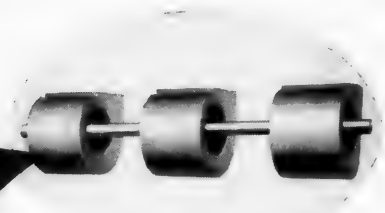
(Continued on page 135)

An Exclusive Design for Industrial Buildings...

WESTINGHOUSE INDUSTRIAL UNIT HEATERS

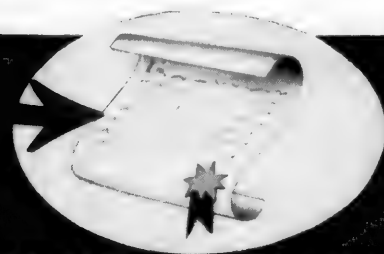


HEATING COILS — Two types: Heavy Duty (shown above) with extra heavy wrought iron finned pipe for high pressure systems or process work. General Purpose, with non-freeze, non-ferrous heating coils.



FAN ASSEMBLY — Centrifugal pressure multi-blade, die-formed type. Self-aligning, grease-lubricated ball bearings are mounted outside the casing for easy maintenance.

★ *Optimum BTU Output!*
★ *Optimum Air Capacity!*
★ *Optimum Versatility!*



ONE WARRANTY — Westinghouse makes every component — COILS, FANS, MOTORS. One supplier responsibility for quick service.

Fourteen basic coil sizes are available to give you optimum (most favorable) selection for either steam or hot water; up to 200 PSIG from 100,000 to 4,000,000 BTU/hr; air capacity for effective circulation, 2,000 to 34,000 CFM.

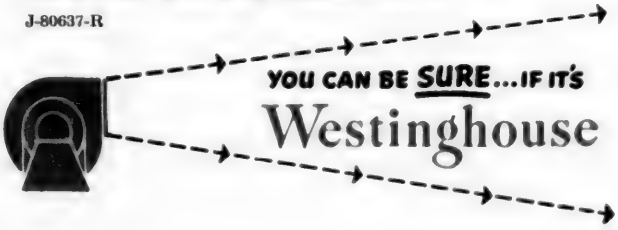
Sturdy casings, heavy-duty bearings and Westinghouse proven-plate fin-coil construction and performance give you a product to meet your most exacting application requirements.

You can't buy more rugged *quality* and *versatility* than is built into the Westinghouse line of unit heaters, designed *exclusively* for industrial applications.

Further, compact Westinghouse units can be mounted on the floor, wall or ceiling, can be relocated to accommodate changes in plant layout. And every unit is backed by a Westinghouse exclusive—*one warranty*—for engineering assistance and single equipment responsibility.

Next time you buy or specify Industrial Unit Heaters, call your Sturtevant Division Sales Engineer. For your copy of Industrial Heater Catalog 1510-2, call him now or write Westinghouse Electric Corporation, Dept. C-4, Hyde Park, Boston 36, Massachusetts.

J-80637-R



Things to Think About in Selecting Sidewall Diffusers

...aspiration, aspect ratio, noise levels, smudging, and other factors

A sidewall diffuser has three basic functions to perform:

1. Attractively cover the duct opening in the wall.
2. Impart direction to air flow.
3. Diffuse the conditioned air thoroughly and rapidly before it reaches the occupancy zone.

If a "diffuser" doesn't truly diffuse, it can drop a solid mass of cold air onto occupants of the room. One way to get around this problem is to direct the air flow from the diffuser toward an unoccupied area of the room. Another method is to use ceiling diffusers even when sidewall diffusers would be easier and more economical to install. Neither solution is ideal.

The Answer

Barber-Colman Uni-Flo sidewall diffusers provide an efficient answer to the problem. They provide very thorough aspiration. A turbulence is created which keeps the cooled air above the occupancy zone for the full length of throw. Conditioned air literally "trickles" into the room. Rapid warmup is secured. There is no mass of cold air to disturb human comfort.

The requirements outlined in this quote are from Heating, Ventilating, Air Conditioning Guide, '58, chap. 30:

"The air discharged from a wall outlet should not reach the occupied zone until the velocity has fallen to about 50 fpm. Therefore, the outlets should be located high enough for the air stream at the termination of throw to be not less than five or six feet above floor level. Or, in other words, the drop should not be more than the difference between mounting height and zone of occupancy."

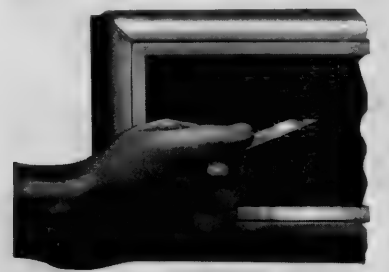


Fig. 2 Barber-Colman Uni-Flo Sidewall Diffuser — Note grille design which creates controlled air turbulence for complete aspiration.

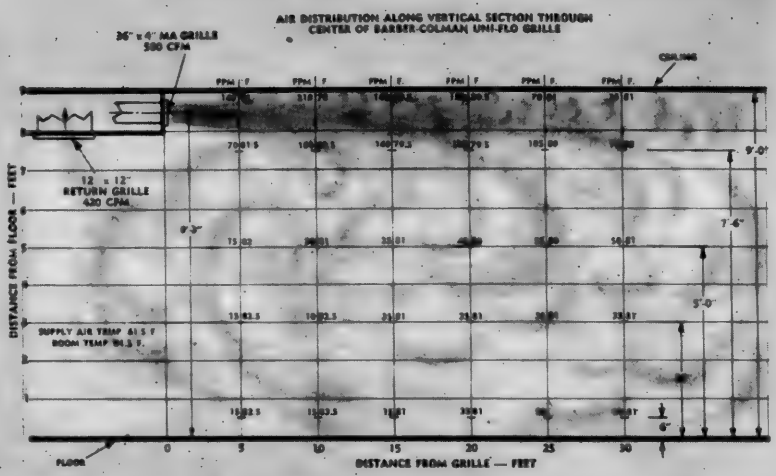

AIR DISTRIBUTION ALONG VERTICAL SECTION THROUGH CENTER OF BARBER-COLMAN UNI-FLO GRILLE
CEILING
12" x 12" RETURN GRILLE 420 CFM
DISTANCE FROM FLOOR — FEET
DISTANCE FROM GRILLE — FEET
FLOOR

Fig. 1 Uni-Flo Grille Traverse — This charts the results you can predict and deliver with Uni-Flo grilles. Only Uni-Flo grilles are true sidewall diffusers guaranteed to perform in accordance with the published data.

It is almost impossible to meet this requirement in a low-ceilinged (9 ft) room without the aspiration provided by Barber-Colman Uni-Flo sidewall diffusers.

Fig. 2 shows how the grille of the Barber-Colman Uni-Flo sidewall diffuser is designed to create air turbulence. This is in direct contradiction to the theory of using "air foil" sections (which create a laminar flow which tends to defeat aspiration and to drop air into the occupancy zone as discussed above).

There is another very nice feature about the Uni-Flo grille design. Not only does it provide for adjustment of horizontal flow, it also provides controlled adjustment in vertical planes. This permits you to steer the air past any obstacles in front of the grille.

Noise Levels

The effect upon noise level of the air turbulence created by Uni-Flo sidewall diffusers is sometimes asked about. Page 7 of Barber-Colman "Grille Engineering Data" contains a listing of noise levels for various air patterns. These figures speak for themselves, showing that there is no noise problem. Incidentally, Barber-Colman offers the most complete diffuser noise level data available, including the effect of dampers in various positions.

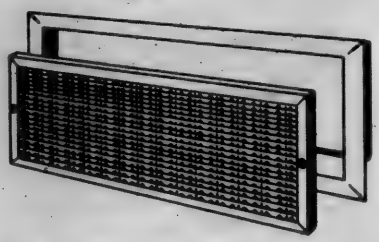


Fig. 4 Removable cores — to simplify installation and maintenance and contribute to good housekeeping.

Aspect Ratio

The aspect ratio of Uni-Flo grilles has a very definite effect on their performance, even though aspect ratio may not matter with other types of diffusers. It assists the excellent aspiration achieved by Uni-Flo diffusers and, therefore, assures more even air distribution throughout the room.

Another feature of Uni-Flo grilles is the removable core which contributes to good housekeeping. The core can be removed without damaging the paint seal around the frame. Also, electroplated cores are available (in

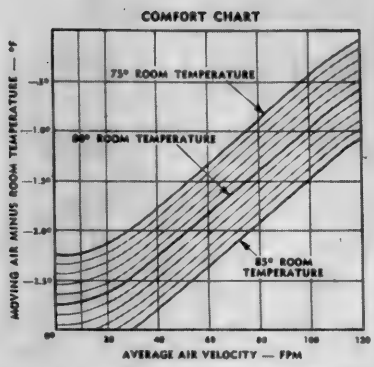


Fig. 3 Barber-Colman Comfort Chart — Here are the conditions of air movement and temperature in the occupancy zone that are required for human comfort standards. All points below the line represent uncomfortable conditions, while those above the line fulfill the requirements. You get required performance with Barber-Colman Uni-Flo sidewall diffusers.

which case the frames are painted to match the wall). Electroplated cores are less conspicuous and more durable and can be easily cleaned.

Accessories

Simple, positive, tamperproof adjustment of the air volume for easy system balancing is provided by the optional Uni-Flo opposed-blade volume control. Although normally key-operated, this can be furnished with an operating knob. Its opposed-blade design prevents any shifting in the damper setting. Deflectrols — factory-assembled deflecting vanes — attached to the rear of the diffuser provide uniform distribution across the diffuser face.

Performance

Barber-Colman diffusers will meet the following specification:

Sidewall and/or ceiling air distribution grilles and diffusers will diffuse air uniformly throughout the conditioned space, but at no point in the occupancy zone will the air velocity exceed 30 fpm at a temperature more than 2° F below the average room temperature or 75 fpm at a temperature more than 1½° F below the average room temperature.

Engineering Data Catalog No. F-4051-2 gives complete information, including 50 pages of selection data which provides all of the information necessary for even the most difficult jobs. Call your local Barber-Colman office or write to:

BARBER-COLMAN COMPANY

Dept. O, 1102 Rock Street, Rockford, Illinois

NEW CATALOGS

(Continued from page 132)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

NEW CONTROL FOR BUILDINGS—Two new controls for buildings are described in bulletins published by Commercial Div., Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. Bulletin 76-4224 describes Air Conditioning Selector, said to be the only control center designed expressly for single-zone air conditioning systems and to give big-building glamour to small-building air conditioning. Bulletin 76-4452 covers the company's Surveillance Alarm System made for buildings where there is critical equipment that needs surveillance all the time but operator attendance only when there is trouble.

Circle **Item 76** on Inquiry Card

COMBUSTION INDICATOR — Because the maintenance of proper ratio of air and fuel is of concern to design, plant and operating engineers, Ess Instrument Co., Bergenfield, N. J., offers Bulletin 802 as pointing the way to fuel savings through increased combustion efficiency. Bulletin describes the company's Hazegage combustion indicator, and outlines the many new operating techniques incorporated into this photoelectric unit.

Circle **Item 77** on Inquiry Card

AUTOMATIC AIR FILTER—Construction and operating characteristics of its new Model B Roll-O-Matic automatic renewable-media air filter are described in Bulletin 248-C available from American Air Filter Co., Louisville, Ky. Featured is the manufacturer's 65-ft roll of media composed of interlaced glass filaments. Operation is explained. Modular design for economical on-the-job assembly is detailed in bulletin.

Circle **Item 78** on Inquiry Card

PACKAGED WATER CHILLERS—A 16-page brochure (Bulletin 8325), describing the redesigned line of American Blower Type CD packaged water chillers for air conditioning and industrial cooling applications, is available from Industrial Div., American-Standard, Detroit, Mich. Bulletin outlines advantages of the units, and discusses the mechanical specifications. A series of schematic wiring diagrams show control panel wiring and control circuit wiring for city water operation and cooling tower operation. Also illustrated are pneumatic control connections. Selection data covers the full range of sizes.

Circle **Item 79** on Inquiry Card

(Continued on page 136)

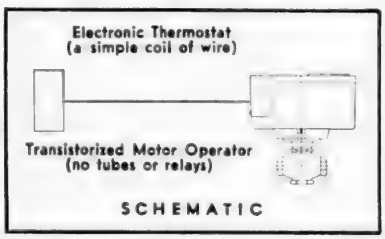
NOW...

Electronic Control at no extra cost!

...new transistorized motor operator for proportional control!

The transistor operator is an electronically controlled device containing a transistorized amplifier and an operating mechanism for proportional operation of a valve (as shown) or damper.

Virtually self-contained, the attachment of a two-wire sensing element forms a complete elec-



tronic control system (see schematic). Wide choice of sensing elements.

Compactness, simplicity, and moderate cost are achieved through the use of transistors and electronic circuitry. This means superior performance and low maintenance.

Spring-return action provides fail-safe performance.

Ask for Brochure F8991

BARBER COLMAN **Automatic Controls**

"Better Control... Electrically"

BARBER-COLMAN COMPANY

Dept. O, 1302 Rock Street, Rockford, Illinois
Field Offices in Principal Cities

for FUME

CONTROL

install

FLEXAUST®

HOSE

Made of strong neoprene coated cotton or nylon fabrics spiral wire reinforced.
For *all* kinds of fume and dust control, and ventilation uses.
Extremely flexible, durable, and lightweight.
Exceptionally easy to cut, install, connect, reuse, and relocate.
Sizes 1¼" thru 36" i.d.

Write for details today
Distributors in all principal cities

THE FLEXAUST COMPANY
Dept. HV-3
[illegible] PARK AVE NEW YORK 17 N Y

NEW CATALOGS

(Continued from page 135)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

PIPE LINE NOISE CONTROL—A bulletin released by Vibration Mountings, Inc., Corona, N. Y., describes how company's Quiet-Flex rubber pipe connections are used to control water line noises, isolate equipment vibration, reduce water hammer, and simplify alignment problems. These lightweight flexible pipe connections are valuable for many applications including pumps, centrifugal compressors, condensing units, water chillers, cooling towers and vacuum service.

Circle **Item 80** on Inquiry Card

TECHNICAL REPRINTS—HCD Reprint No. 1, a compilation of recent papers on the air-handling unit phase of high velocity air conditioning systems, by C. W. Pollack, its manager of air conditioning and refrigeration, is offered by Drayer-Hanson, a division of National-U. S. Radiator Corp., Los Angeles, Calif. The subject has been presented before various industry association local-area chapters around the country. Discussed, among other things, are such factors as conventional draw-through air handling with high pressure draw-through unit; typical standard zone damper arrangements; comparative studies of various manufacturers' high pressure equipment design; and internal static pressure correction, correlated with fan outlet velocity.

Circle **Item 81** on Inquiry Card

CONVECTION CONDENSER — Bulletin AV-3, published by Edwards Engineering Corp., Pompton Plains, N. J., is a complete engineering manual for specifying the company's convection air-cooled refrigeration condenser. This unit boasts condensation without noise, maintenance, power cost, fans, motors, or water. Tables, charts, and text give recommended face areas, sections available and their prices, recommended layouts for possible condenser-compressor arrangements, and head pressure control valve sizing and cost data. General engineering data are also included.

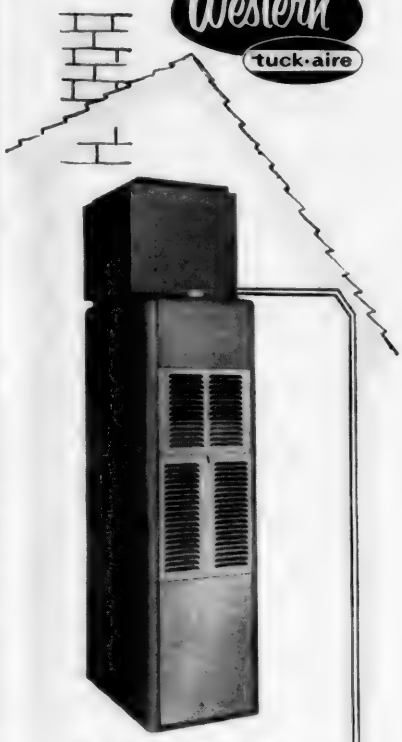
Circle **Item 82** on Inquiry Card

HOSE COUPLINGS AND FITTINGS — Eight-page condensed Catalog 34, published by Hose Accessories Co., Philadelphia, Pa., contains essential information on the company's wide line of Le-Hi hose couplings and fittings for every type of industrial rubber hose. Descriptions and illustrations of several new items are also included.

Circle **Item 83** on Inquiry Card

The *New* Look In Year Around Air Conditioning

Western tuck·aire



1. Filtered Forced Air Gas Furnaces
2. Counter-Flo or Up-Flo-Twenty-four Models
3. Heating Capacities—60,000 to 250,000 BTU
4. Cooling Capacities—Two to 7½ Tons
5. Air Cooled Remote Condensing Units
6. Matching Evaporator Coils

tuck·aire FURNACE COMPANY
2045 Evans Avenue • San Francisco, Calif.
"PIONEERS AND LEADERS IN AIR CONDITIONING COMFORT"

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

REFRIGERATION PRODUCTS — A 12-page catalog, available from Cyrus Shank Co., Chicago, Ill., describes the company's ammonia valves and refrigeration products. Included are shut-off valves, expansion valves, check valves, purge valves, relief valves and assemblies, and 300-lb malleable iron fittings.

Circle **Item 84** on Inquiry Card

DISPOSABLE AIR FILTER—New technical literature is available on the HP-2, a disposable dry-type filter manufactured by Farr Company, Los Angeles, Calif., for use wherever extra air cleaning efficiency (over 35% atmospheric discoloration test) is required. Bulletin B-1300-3 describes the high-performance filter as both flame and tear proof.

Circle **Item 85** on Inquiry Card

BOILERS, PRESSURE VESSELS—A handy wall chart, titled Quick Reference Guide to ASME Boiler and Pressure Vessel Code (Section VIII), is available from Missouri Boiler and Tank Co., St. Louis, Mo. Purpose of the chart is to illustrate some of the types of pressure vessel construction provided for under Section VIII of the ASME Code, and to furnish direct references to the Code rules that apply to these construction features. For example, circumferential joints are illustrated along with the suggestion to refer to Code rules UW-34 and UW-35 for a full discussion of such joints.

Circle **Item 86** on Inquiry Card

DUST AND FUME CONTROL — A 24-page application handbook, entitled Industry Relies on Dustube Collectors for Efficient Dust and Fume Control, is offered by Wheelabrator Corp., Mishawaka, Ind. This book describes a wide range of industrial dust and fume producing processes that can be successfully controlled with the properly designed cloth or glass bag-type dust collectors.

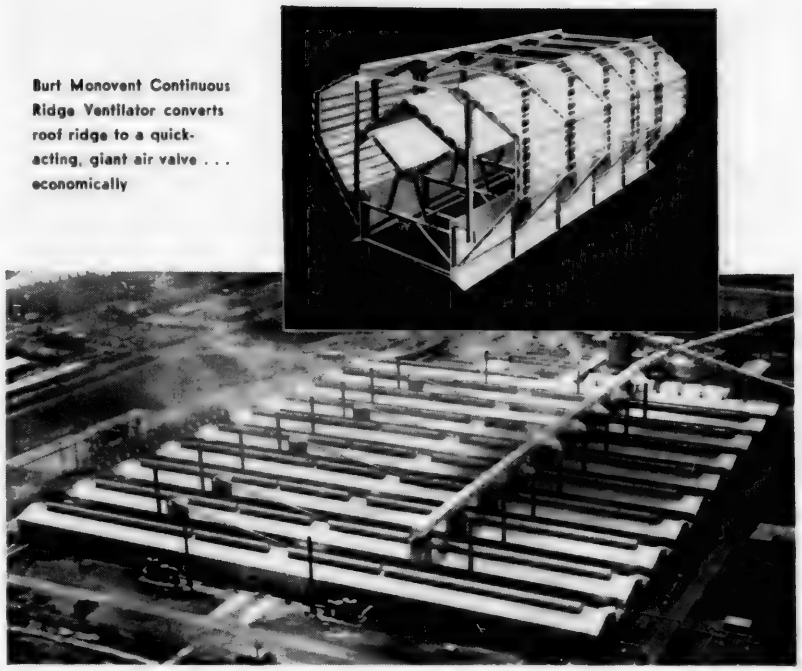
Circle **Item 87** on Inquiry Card

RIGID PLASTIC FANS—Two bulletins, designated Nos. 9-20 and 9-21, describe a line of corrosion-proof rigid plastic fans available from Atlas Mineral Products Co., Mertztown, Pa. The first tells about centrifugal fans in sizes from 10½ to 35 inches; the second about twin-flow fans available in sizes from 12 to 48 inches. Fans are made from Ampcoflex Type 1 polyvinyl chloride, said to offer high chemical resistance with high structural strength.

Circle **Item 88** on Inquiry Card

(Continued on page 138)

Burt Monovent Continuous Ridge Ventilator converts roof ridge to a quick-acting, giant air valve . . . economically



POT ROOM AIR MOVES OUT FAST AT REYNOLDS ALUMINUM

The huge new Reynolds Metals Company's aluminum plant at Sheffield, Alabama, conditions the air in each manufacturing operation with a carefully engineered system of modern Burt Ventilators.

On the pot lines, where the snow-white alumina powder is transformed into aluminum in a bath of molten cryolite—where great crucibles of molten metal swing down the aisles — 84" aluminum Burt Monovents keep the air moving out fast. Over 7,200 lineal feet of this continuous ridge type Burt ventilator—more than 1⅓ miles—ventilates the nine pot line buildings uniformly and economically. Nearly 400 lineal feet of 60" Burt Monovent conditions the service building.

Atop the adjoining rectifier building, with its thousands of square feet of electrical equipment, twenty-five 54" aluminum Burt Free Flow Fan and Gravity ventilators provide fast, big-volume exhaust.

Thirty additional aluminum Burt Free Flow Gravity ventilators serve the pin cleaning, coke and ore unloading and carbon paste buildings.

In the big Reynolds installation only two Burt ventilator types were required. Other types and sizes might better solve your air moving needs. You will find them all readily available in the complete line of time-proven, modern Burt Ventilators.

Send for **FREE** *Data Book!*

Write for Burt Data Book SPV-101-G.
It supplies quick data on Burt's complete line of modern Roof Ventilators.

FAN & GRAVITY VENTILATORS • LOUVERS • SHEET METAL SPECIALTIES

The Burt Manufacturing Company

49 E. South St. Akron 11, Ohio

MEMBER AIR MOVING & CONDITIONING ASSOCIATION, INC.

NEW CATALOGS

(Continued from page 137)

INUSTRIAL SPRAY NOZZLES — Industrial Nozzle Div., Wm. Steinen Manufacturing Co., Newark, N. J., announces a new catalog covering its complete line of industrial spray nozzles. Catalog contains 32 pages listing data on all types of nozzles for industrial spraying applications. Specific data on spray angles, dimensions, types of connections, and capacity vs. pressure for all standard nozzles are presented in simplified selection tables.

Circle **Item 89** on Inquiry Card

REGISTER, GRILLE SELECTION—A 60-page book containing detailed engineering data on registers and grilles for heating, air conditioning, and combination heating-cooling is published by The Auer Register Co., Cleveland, Ohio. Entitled The Auer Engineering File, the brochure covers both domestic and commercial units. It includes engineering and performance data, selection charts, sizing data, and dimensional drawings suitable for submittal and rough-in calculations. Also included is a cross-reference table of commercial registers and grilles, showing style numbers and descriptions of all known manufacturers' lines.

Circle **Item 90** on Inquiry Card

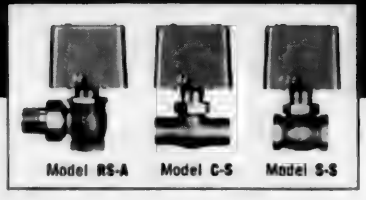
for satisfied customers and more sales volume

sell

ZONVALVE

the best in modern

ZONED HEAT



Model RS-A Model C-S Model S-S

ZONED HEAT means:
more comfort, less fuel!

Zoned heat is now recognized as the ultimate in modern heating. Its advantages are two-fold:

1) *Comfort* – each area of the home or building may be heated automatically to the desired temperature.

2) *Economy* – heating plant need no longer burn fuel to furnish unwanted heat.

ZONE CONTROL VALVES are the most *economical* devices for accomplishing zone heating control. With them, multiple zones may be individually controlled from a single burner and circulator.

Each zone is controlled by its own thermostat. All wiring is inexpensive low-voltage.

ZONVALVES mean:
more profits, better jobs!

ZONVALVE is a zone-control valve of *outstanding quality*, as well as extremely low price.

Zonvalve is thermostatically operated. All Zonvalves contain a built-in auxiliary switch, which *automatically* starts circulator or burner, when any Valve is in "open" position.

Zonvalve may be installed in any position on supply piping or individual radiator. In modernization, Zonvalve replaces the ordinary radiator valve with *no piping change*, no shutdown of heating system.

Zonvalve is compact, rugged in construction. It is manufactured in standard tubing and pipe sizes. Operates on steam and hot water systems. *Unconditionally guaranteed.*

Zonvalve is ideal for zoned heat in homes, offices, factories, hospitals, hotels and motels.

For fast sales, *sell Zonvalve!*

For full details, ask your wholesaler or write for Brochure D-3.

HEAT-TIMER CORP. · 657 BROADWAY, NEW YORK 12, N.Y.

PIPING AND DUCT THERMOMETERS—A brochure describing two piping and two duct thermometers of its manufacture is offered by Jas. P. Marsh Corp., Skokie, Ill. One piping thermometer is designed for mounting on pipe lines or vessels, the other is of the remote type. One duct thermometer is for direct mounting into air ducts, kilns, ovens, etc.; the other is remote reading. All four are of the adjustable dial type. All information needed to specify, including price list, included.

Circle **Item 91** on Inquiry Card

TIME SWITCH SELECTION — Catalog No. 159, issued by Tork Time Controls, Inc., Mount Vernon, N. Y., contains a complete section devoted to an explanation of switching and timing. Armed with this knowledge, one can proceed to the company's listing of all available Light & Power time switches with a full understanding of what each will do and where to use it. Detailed drawings and explanations will dispel any possible confusion the reader may have relative to the use of, for example, double-throw, three-pole, or two-circuit switches.

Circle **Item 92** on Inquiry Card

AIR CONDITIONING LINE— Three catalog pages, published by Coolerator Div., McGraw Edison Co., Albion, Mich., describe components of its Thomas A. Edison air conditioning line. Form 9ES11 covers self-contained central air conditioners in 2, 3, and 4-hp models; Form 9ER12, its remote air-cooled condensing units in 3, 4, and 5-hp models; and Form 9EC13, its blower-coil units and coil sections for remote installations and for adding to any forced air heating plant, in the same tonnages.

Circle **Item 93** on Inquiry Card

NEW MANOMETERS—Two manometers of new design are illustrated and described in a catalog offered by Trimount Instrument Co., Chicago, Ill. The manometers are designated Models C-22 and C-12 respectively, and their exterior design is highlighted by the black scale with white numerals and increments. Model C-22 is a (normal) well-type manometer, while Model C-12 is a raised well type. Operating data are identical, with maximum operating pressures of 400 psig and ranges from 12 to 130 inches.

Circle **Item 94** on Inquiry Card

ROOF VENTILATORS— Roof ventilators for every industrial purpose are described in a bulletin issued by Bowman Steel Corp., Pittsburgh, Pa. Available equipment includes power type, gravity type, and continuous ridge ventilators. Equipment may be corrosion resistant if desired. Bulletin includes tables of dimensions and capacities.

Circle **Item 95** on Inquiry Card

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

ELECTRIC STRIP HEATERS—Edwin L. Wiegand Co., Pittsburgh, Pa., offers a new bulletin, F-1613, that describes its line of Chromalox electric strip heaters. Thirty-two illustrations show how this type of heater is used across industry for four general purposes: To keep viscous and heavy compounds moving smoothly; for ovens and special-purpose air heating; for tanks, kettles, drums, etc.; and for new or converted platens and other production equipment.

Circle **Item 96** on Inquiry Card

GRAVITY VENTILATORS—Brochure No. 59 describes Series SR low silhouette natural gravity type ventilators manufactured by Colt Ventilation of America, Inc., Los Angeles, Calif. After discussing the advantages of this type of unit, the catalog describes the units available, presents engineering data, dimensions, installation data, etc. Also offered is a lecture on fire control in industry by M. J. Reaney, the company's vice-president. It begins: "The idea of venting a fire may be quite new to you. . . ."

Circle **Item 97** on Inquiry Card

COOLING TOWERS— Literature on cooling towers is offered by J. F. Pritchard & Co. of California, Kansas City, Mo. Bulletin 56-902 presents engineering data, specifications, and capacity table for natural draft towers, in steel and redwood or all-steel construction. Bulletin 55-902 gives similar data for the company's Series V vertical induced draft cooling tower with centrifugal fan, said to be the ideal tower where space is a problem.

Circle **Item 98** on Inquiry Card

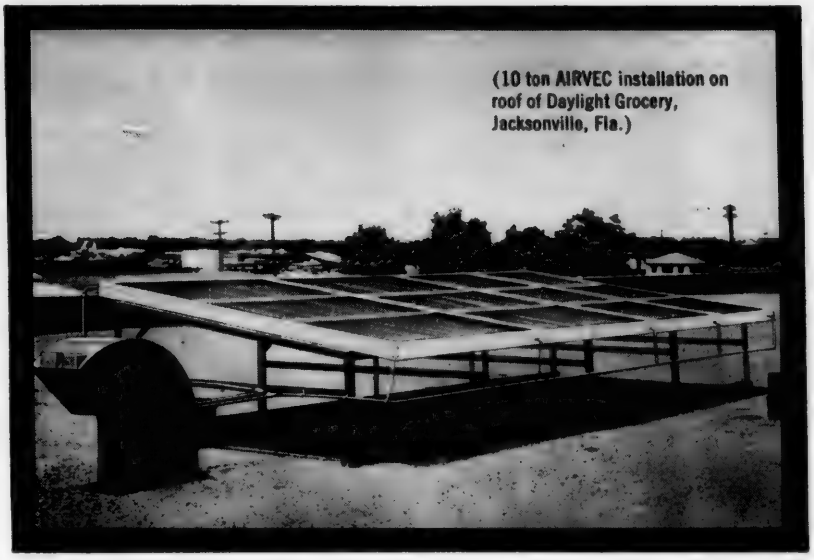
PACKAGED STEAM GENERATOR—Brochure No. PG-58-2 is available from Foster Wheeler Corp., New York, N. Y. Features, standard and optional equipment, table of capacities, dimensions, and a cut-away drawing of its packaged steam generator are given.

Circle **Item 99** on Inquiry Card

SINGLE-PHASE MOTORS—A bulletin, 470-B, published by Motor Div., Robbins & Myers, Inc., Springfield, Ohio, describes its expanded line of integral horsepower single-phase motors. Available in ratings from ¾ to 20 hp, the line includes open protected, and totally enclosed fan cooled and explosion proof frames. Tabulated ratings, dimensions and weights are included in bulletin.

Circle **Item 100** on Inquiry Card

(Continued on page 140)



(10 ton AIRVEC installation on roof of Daylight Grocery, Jacksonville, Fla.)

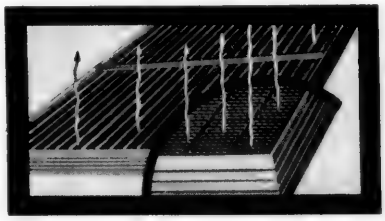
EDWARDS AIRVEC

...the air-cooled refrigerant condenser that eliminates fans, cooling towers, noise and maintenance.

For condensing refrigerants Edwards AIRVEC offers a simple, economical method that makes possible, for the first time, the elimination of fans, motors, and cooling towers! Because of its unique operating principle, AIRVEC requires no electrical power—the refrigeration or air conditioning system using AIRVEC requires 20% less power. With no moving parts there is no need for belts, pumps, fans or costly maintenance—and it's absolutely silent. And water is not used in the AIRVEC so there is no water treatment problem or periodic cleaning of condensers and towers.

The size of the condenser is virtually unlimited: you just assemble single AIRVEC elements in a single plane until the required area is covered. Initial installation costs are lower, too. And AIRVEC is so light that little or no special rigging is required.

Its low, unobtrusive silhouette blends easily with any architecture, leaving more useable space within the building proper. Roof loads are negligible so no extra beams are needed. Edwards AIRVEC Condensers are available in nominal sizes of 1.25, 2.50 and 3.75 tons and larger assembles up to hundreds of tons.



The refrigerant gas is cooled and condensed by the movement of convection air moving upward through the AIRVEC condenser.

Write today for comprehensive technical data.

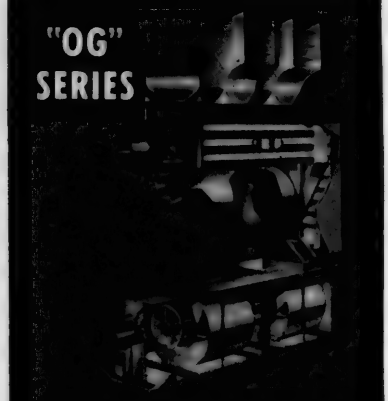
EDWARDS ENGINEERING CORP.

1608 Alexander Avenue • Pompton Plains, New Jersey

Telephone TEmple 5-2808 • TEmple 5-3352

WORLD'S LARGEST MANUFACTURER OF WATER-COOLED CONDENSERS FOR PACKAGED EQUIPMENT.

"OG" SERIES



LENNOX

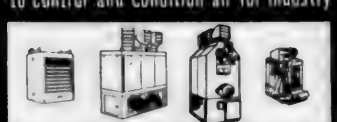
GAS...OIL...OR NEW TYPE

Dual Fuel

POWER BURNERS

Combination burners are available for the "OG-4," and are interchangeable with single fuel burners. All burners are of the same general construction; switching from dual fuel to a single fuel burner involves changing only one or two minor parts. On all burners the combustion air is pre-heated. "Push button" changeover from one fuel to another and electric gas ignition give added ease of operation and safety to the combination burners. Write today for the full story.

LENNOX "Task Matched" Equipment to control and condition air for industry



64,000 to 2,000,000 Btuh Units

CLIP AND MAIL FOR FREE SPEC SHEETS

LENNOX Industries Inc.
INDUSTRIAL DIVISION
Box 1294, Dept. AC-3,
Des Moines 5, Ia.

Please send me—without obligation—complete specifications and engineering data on Lennox "OG" Series Industrial Heaters

Name_____

Company_____

Address_____ City_____

Title_____

NEW CATALOGS

(Continued from page 139)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

BROAD LINE OF PUMPS— Bulletin B-1300, published by Peerless Pump Div., Food Machinery and Chemical Corp., Los Angeles, Calif., describes what the company states is one of the broadest lines of pumps, capable of handling water and other non-abrasive liquids in quantities up to 70,000 gpm: the company's Type A pump. Cutaway sectional views and cross-section drawings describe the pumps in detail. Complete dimensional and performance data are supplemented by a page of sample specifications.

Circle **Item 101** on Inquiry Card

VACUUM CLEANING SYSTEM—A brochure published by Forney-Miracle-aire, Inc., Fort Collins, Colo., gives complete information and specifications on the Miracle-aire vacuum cleaner system. As installed the system provides a means of vacuuming rugs, floors, furniture and drapes with just a hose and attachments. Outlets in convenient locations resemble electrical convenience outlets, and make it possible to reach every part of the home, motel, hotel or office building. Installation of system should be made by recognized heating and plumbing contractors.

Circle **Item 102** on Inquiry Card

SWIMMING POOL HEATER—Form 83a describes the fully automatic swimming pool heater manufactured by Raypak Co., Inc., El Monte, Calif. Included is a discussion of the problem of poor temperature control caused by pressure variations from different degrees of filter sedimentation, and the company's solution. Necessary change in pool temperatures with climatic conditions is covered. The 4-page illustrated brochure presents specification data, including sizing formula and chart.

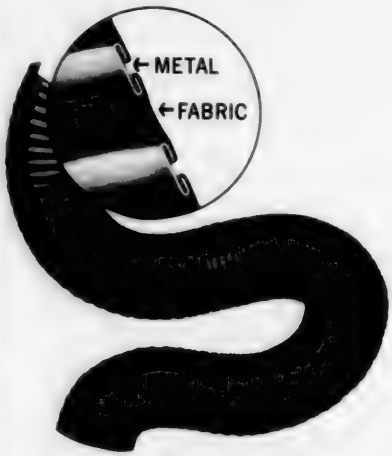
Circle **Item 103** on Inquiry Card

ELECTRIC HOISTS—Bulletin 158-G describes the complete line of CM Lodestar electric hoists, including the three new larger capacity and higher speed models recently introduced by Chisholm-Moore Hoist Div. of Columbus McKinnon Chain Corp., Tonawanda, N. Y. Hoists are now available in capacities from ⅛ to 2 tons with a wider range in lifting speeds.

Circle **Item 104** on Inquiry Card

(Concluded on page 142)

WHY THERE'S NO "OR EQUAL" WHEN YOU SPECIFY WIREMOLD AIR DUCT



Unlike any other flexible air duct, Wiremold Air Duct is made with a *flat* metal spiral that *mechanically locks* to the fabric component. Here's what this construction means to you:

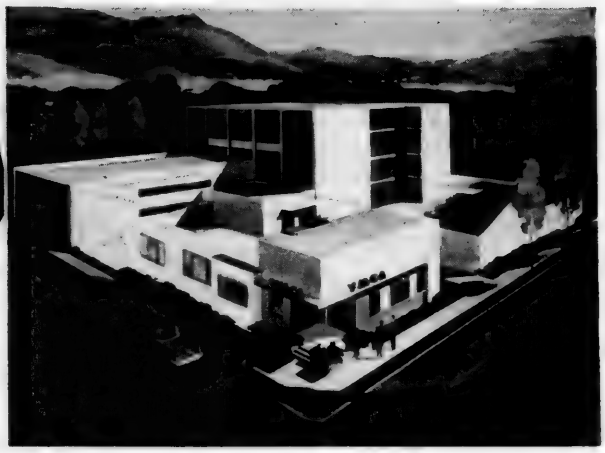
- With Wiremold you get a *mechanically locked* seam the same as you insist upon with sheet metal duct. There are no glues or adhesives that may dry out and fail with age.
- Wiremold's exclusive *flat* metal spiral assures accurate size — and snug connections.
- Cuffed ends (and cuffing equipment) are never needed.
- Unlike ducts with cuffed ends, Wiremold's fabric and metal are *both* secured to end fittings, making stronger connections.
- Two lengths of Wiremold can be joined simply by screwing them together. No collars or clamps are needed.

FOR AIR CONDITIONING • EXHAUSTING
MATERIALS HANDLING • MANY OTHER USES

WIREMOLD® AIR DUCT

ask your distributor, or write
THE WIREMOLD COMPANY • HARTFORD 10, CONN.

ANOTHER OUTSTANDING USE OF THERMAL EQUIPMENT



This modern structure for the Burbank Y.M.C.A.* includes Thermal forced air heating and ventilating units.

Thermal is proved equipment, specified with confidence that it will produce the utmost in performance and dependability. Write for detailed specifications.

*Architects:
Prescott & Whalley, A.I.A., Los Angeles and Burbank, Calif.
Consulting Engineer:
Joseph E. Kiskis, Los Angeles, Calif.
Air Conditioning Contractor:
R. H. Wessel Co., Burbank, Calif.

THE THERMAL LINE INCLUDES:

- Central Plant Air Conditioners
- Multizone Air Conditioners
- Sprayed Coil Units
- Heating and Ventilating Units
- Cooling and Heating Coils
- Air-Cooled Condensers

Agents in principal cities.

Quality Products Since 1945
THERMAL ENGINEERING CORPORATION
2605 W. DALLAS • P. O. BOX 13254
HOUSTON 19, TEXAS

economy

BTU for BTU, Reznor gas unit heaters cost much less than most other types of heating equipment. Installation offers additional savings . . . it requires only suspension, gas and electrical connections, and simple venting. And Reznor suspended units help you hold down total cost per usable square foot . . . because they occupy absolutely no valuable floor space.

ECONOMY makes these completely-automatic packaged units the ideal way to heat a wide variety of commercial and industrial buildings. Ask your Reznor distributor for the complete story or write for your free copy of "Modern Heating"

Look for Reznor under "Heaters-Unit" in the Yellow Pages

REZNOR
WORLD'S LARGEST SELLING DIRECT-FIRED UNIT HEATERS

Reznor Manufacturing Company, 64 Union Street, Mercer, Pa.

30% Savings on Labor Cost
A Permanent Bond
A Better, Neater Job
with
ST. CLAIR
Specially Formulated
INSULATION ADHESIVE

ST. CLAIR Insulation Adhesive specially formulated for bonding insulation material to metal, supersedes pins and clips, wires, screws, and caps. Provides easier, quicker handling. For bonding immediately or up to 45 minutes later.

Send Today For
CATALOG SHEET—PRICES
SAMPLE

ST. CLAIR RUBBER CO.
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DETROIT 26, MICHIGAN

News about

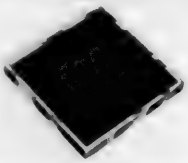
AIR FILTERS

SELF-CLEANING AIR FILTER

automatic rotating double-wall panel curtain available with air or electric drive.

The panels in the Automaze curtain type filter are cleaned and recharged automatically with adhesive. A rotating curtain that holds individual panel filters submerges the panels in an oil reservoir on a timed cycle to dislodge and deposit accumulated dirt in the reservoir. As a result, the Automaze stays clean indefinitely to maintain uniform air flow. Goes 3 to 6 months without attention.

HIGH VELOCITY AIR FILTER PANELS



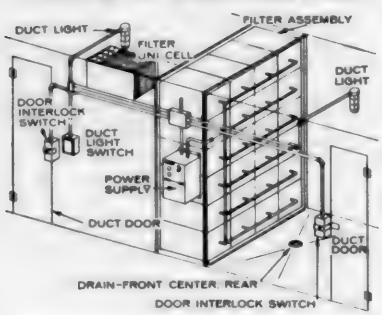
all-metal, permanent, washable panels for ventilating and air-conditioning systems.

Turboflow action of these filter panels handles 50% more air (up to 3 cfm per square inch gross area) than conventional panels, with high filtering efficiency up to 600 fpm face velocity.

This P-5 Air-Maze panel filter has low static pressure drop, extra large dirt-holding capacity, requires less servicing than ordinary filter panels.

HIGH VELOCITY ELECTRONIC AIR CLEANER

for removing dirt particles of sub-micronic size in ventilating and air-conditioning systems.



This two-stage electrostatic air cleaner removes smoke, fumes and carbonaceous matter in particle sizes down to 1/100 micron. Handles 50% more air than conventional designs to conserve space and cost of installation. Dirt-cleaning efficiencies range from 85% to 90% at face velocities up to 600 fpm and up to 98% at lower face velocities. Provisions made for periodic cleaning with automatic semi-automatic or manual washing.

FOR AIR CONDITIONING AND VENTILATING EQUIPMENT, ENGINES, COMPRESSORS *or any device using air or liquids*—there is an Air-Maze filter engineered to solve each filtering problem. For new all-line catalog, write Air-Maze Corporation, Dept. AC-3, Cleveland 28, Ohio.

AIR-MAZE
The Filter Engineers

AIR FILTERS • SPARK ARRESTERS • LIQUID FILTERS SILENCERS • OIL SEPARATORS • GREASE FILTERS

NEW CATALOGS

(Concluded from page 140)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

MECHANICAL DEHUMIDIFIERS—Bulletin MD-4 introduces the line of mechanical dehumidifiers available from M. Blazer & Son, Passaic, N. J. The line uses Freon compressors, producing dewpoints to 36 deg F. Means of achieving dewpoints to —25 deg are discussed.

Circle **Item 105** on Inquiry Card

FULL CONDITIONING LINE—A comprehensive catalog on its air conditioning equipment is offered by Thermal Engineering Corp., Houston, Tex. Brief descriptions of its one to 16-ton conditioners and its sprayed coil conditioners are given. Roughing-in dimensions for central plant units, multizone units, direct expansion coils, water coils, standard steam coils, nonfreeze coils, etc., are followed by a selection data section which contains complete engineering tables for calculating size requirements for the full line. There are also supplemental data on refrigerant distributors, fans, motors, and filters.

Circle **Item 106** on Inquiry Card

ADHESIVES, COATINGS, SEALERS—A 12-page illustrated catalog describing design concepts, typical applications, and general characteristics of adhesives, coatings and sealers is available from Adhesives, Coatings & Sealers Div., Minnesota Mining & Mfg. Co., St. Paul, Minn.

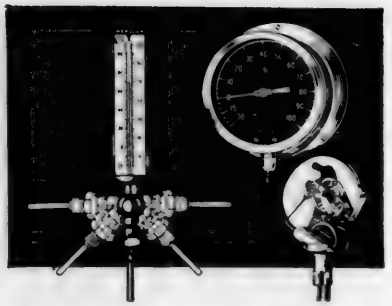
Circle **Item 107** on Inquiry Card

COMMERCIAL FOOD WASTE DISPOSER—A 4-page brochure that describes in detail The Kitchen Pig, a food waste disposer built specifically for heavy-duty commercial use, is available from Weightman and Associates, Burbank, Calif. All plumbing and electrical data needed to specify or install are included.

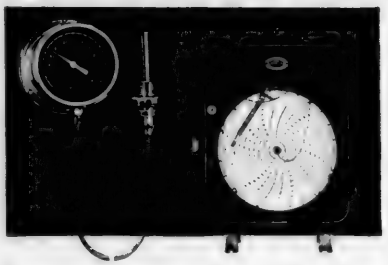
Circle **Item 108** on Inquiry Card

COOLING EQUIPMENT—Catalog C-59, published by Thomas Beckett & Co., Inc., Dallas, Tex., describes the firm's 1959 line of cooling equipment. Included are upright recirculating pumps, brass submergible pumps, automatic condensate units, and cooling accessories. Performance data and specifications are listed.

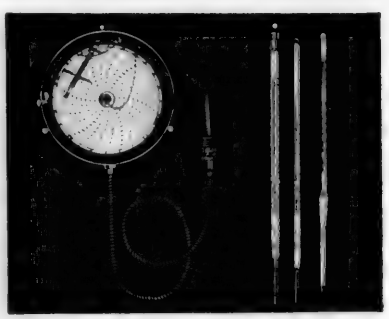
Circle **Item 109** on Inquiry Card



The shortest distance between need and source



for accurate, long-lasting instruments to indicate



and record temperature, pressure and humidity is the distance between you and a Weksler catalog.

Weksler has long been the first name for standard and custom built instruments made to serve your particular industry best.

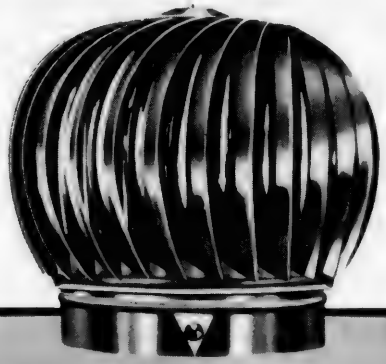
It will pay you to know Weksler instruments better. Write today for our condensed catalog.

WEKSLER INSTRUMENTS

WEKSLER INSTRUMENTS CORP.
FREEPORT, L. I., NEW YORK
INDICATING AND RECORDING INSTRUMENTS FOR TEMPERATURE, PRESSURE AND HUMIDITY

1 ALL-STANDARD DUAL-DUCT FANS ■ News of the Month *(Continued from page 126)*

Nothing but the best...



WESTERN ROTARY ROOF VENTILATORS

with

Lifetime Guaranteed BEARINGS

1. "Backward curved blower wheel" type mechanism assures high, constant exhaust capacity.
2. No backdraft, ever.
3. Unique factory lubricated sealed bearings are specially designed for positioning load, countering wind pressure, assuring stability.
4. Locked-on rotor, yet removable without special tools.
5. Exclusive Western corrugated vane increases rigidity.
6. Low, functional type adds beauty.
7. Aluminum, copper, or stainless steel construction available.
8. Baked enamel paint coating for beauty and long life.

Other type ventilators include:

- Stationary
- Directional
- Continuous ridge
- Vertical exhaust
- Axial roof
- Unit ventilators

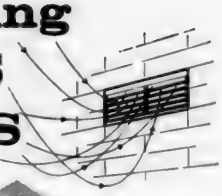
Write for catalog and name of nearest representative.

WESTERN ENGINEERING AND MFG. CO.
4108 Glencoe Avenue, Venice, California

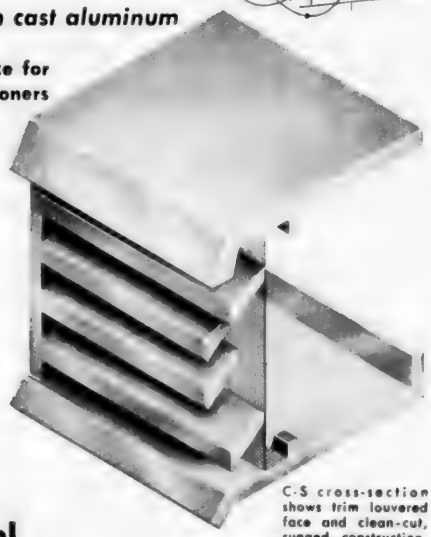
C/S

ventilating BRICKS and BLOCKS

in cast aluminum



ideal air intake for unit air conditioners



C-S cross-section shows trim louvered face and clean-cut, rugged construction, with integral cast water-stop and snugly fit screening.

neat sturdy economical high air intake efficiency

When you design your next air conditioning or ventilating project—be sure to consider the benefits you can get using C-S vent bricks or blocks. You can be sure they will cost less to buy. What's more, they cost less to install because their dimensions are the same as those of standard or jumbo brick, or block. Twelve modular sizes are available for standard brick construction, two for jumbo brick, and three for cinder or concrete block construction—to go in as the wall goes up.

Another thing: C-S vent bricks and blocks are certified tested, comply with F.H.A. requirements—and give complete customer satisfaction. They cannot rust, corrode, or stain adjacent walls. They are durable—rugged—good looking and are available in a variety of finishes to meet job requirements.

model 4-B—representative of 13 modular brick and block sizes available — is equal to four standard bricks, measures 16½" x 4⅞" x 4" and has a high free area.

representatives in all principal cities
—same day shipment

Write today for 1959 C-S catalog and price and specification data.

C/S **CONSTRUCTION SPECIALTIES, INC.** AV-3-59
55 Winans Avenue Cranford, New Jersey

Please send me the new 1959 C-S brick size vent catalog and complete price and delivery data.

Name_____

Firm_____ Title_____

Address_____

ALL STANDARD D-H "PERMA-FAN"

DRAYER

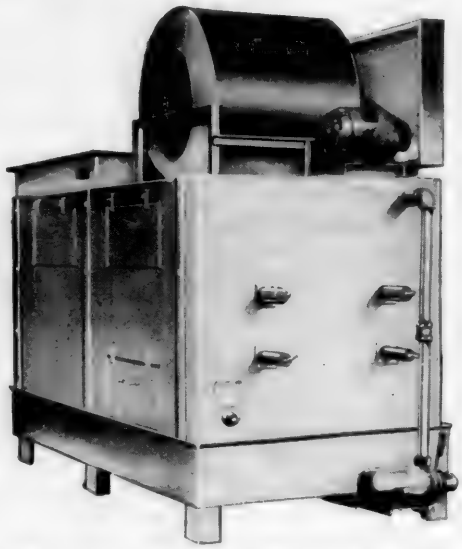
EVAPORATIVE CONDENSERS

HANSON

ARE HOT-DIP GALVANIZED

"PERMA-FAN"

AFTER FABRICATION!



A D-H EXCLUSIVE! FOR FREON 12; FREON 22; AMMONIA. THE D-H PIONEERED BLOW-THRU PRINCIPLE...NOT DRAW-THRU! PRIMARY COIL SURFACE COPPER TUBING. VOLUME DAMPER ADJUSTMENTS. PRICE? WAY DOWN, ON BEDROCK! 12 MORE FEATURES SHOWN IN OUR "PERMA-FAN" BULLETIN. MAY WE SEND YOU A COPY? WRITE:

d-h SINCE 1910

drayer-hanson

DIVISION OF NATIONAL-U.S. RADIATOR CORP

3301 MEDFORD STREET

LOS ANGELES 63, CALIFORNIA

CABLE: CLINCONI LOS ANGELES

UNEXPECTED ATTENDANCE

swells Philadelphia Air Conditioning Exposition. Many new and improved products traced to research.

The 14th International Heating and Air Conditioning Exposition in Convention Hall, Philadelphia, January 26-29, exceeded any previous display there in size and attendance. For the first time it occupied the auditorium and all exhibition halls. More than 450 exhibits were assembled, and attendance outran expectations. Visitors registered from all of North America and twenty foreign countries for a week totaled 20,000.

Research and product development, responsible for many innovations at Philadelphia, has a solid background in the fundamental studies conducted by many of the exhibitors and by the American Society of Heating and Air-Conditioning Engineers, under whose auspices the Exposition was held. The Society's own display illustrated the influence of window shading on heat gain from sunlight in the home.

• **ELECTRIC HEATING**—Several types of electric baseboard heaters were introduced. In addition to displays by several established makers of portable electric heaters a new element was introduced by exhibits of three infrared radiant heaters for spot heating in the home, as well as for industrial applications. An innovation was an electric perimeter air distributing system having a heating element in each zone. This arrangement invites chilled air distribution during hot weather. Another manufacturer of electric baseboards and portable heaters offers a special radiant cable to be incorporated in ceilings under the plaster.

• **RADIANT HEATING**—Three types of radiant heating, cooling and sound-deadening ceilings were on view. Two incorporate heating and cooling coils in conjunction with perforated metal panels. The third provides an aluminum-heating-cooling panel to be incorporated in a standard acoustical tile ceiling. At the opposite extreme, two proponents of the heated floor made a first appearance at Philadelphia, both involving structural modifications of the building design. One is a hollow floor construction used to distribute heated and cooled ventilating air to perimeter registers. The other is a sub-floor construction for commercial buildings consisting of load-carrying cellular steel beams which are used for heating-cooling air distribution. A unique feature of this system is an "aerator" which serves as a mixing box to blend hot and cold air in response to thermostatic control and also permits the use of the hot side as a source of supplemental cooling during the warm season.

• **COMMERCIAL—INDUSTRIAL CONDITIONING**—Equipment for heating and cooling in the industrial, commercial and institutional fields was heavily represented at the Exposition, with emphasis on improvements. For central high velocity air systems, two new methods of controlling volume and temperature were shown, while a new central system of combined heating, air conditioning and ventilation for apartments, hotels and offices, provides a separate blower for each space but reverses air circulation according to heating or cooling phase. For heating,

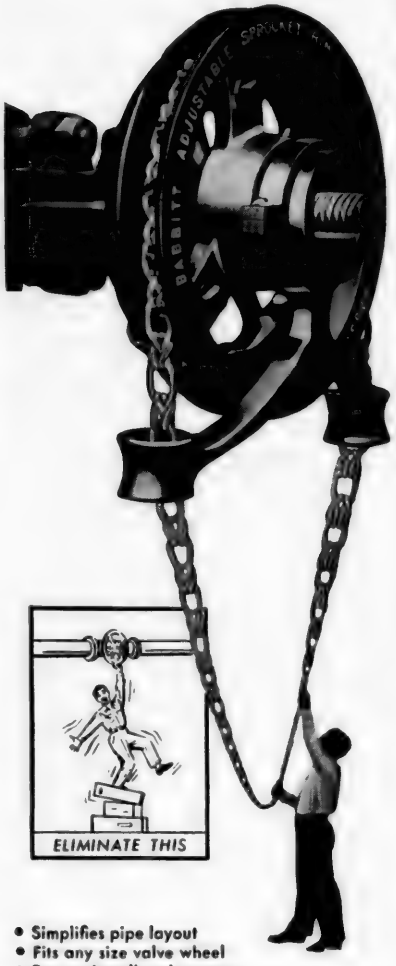
(Continued on page 146)

SAFE OPERATION OF OVERHEAD VALVES

with a

Babbitt

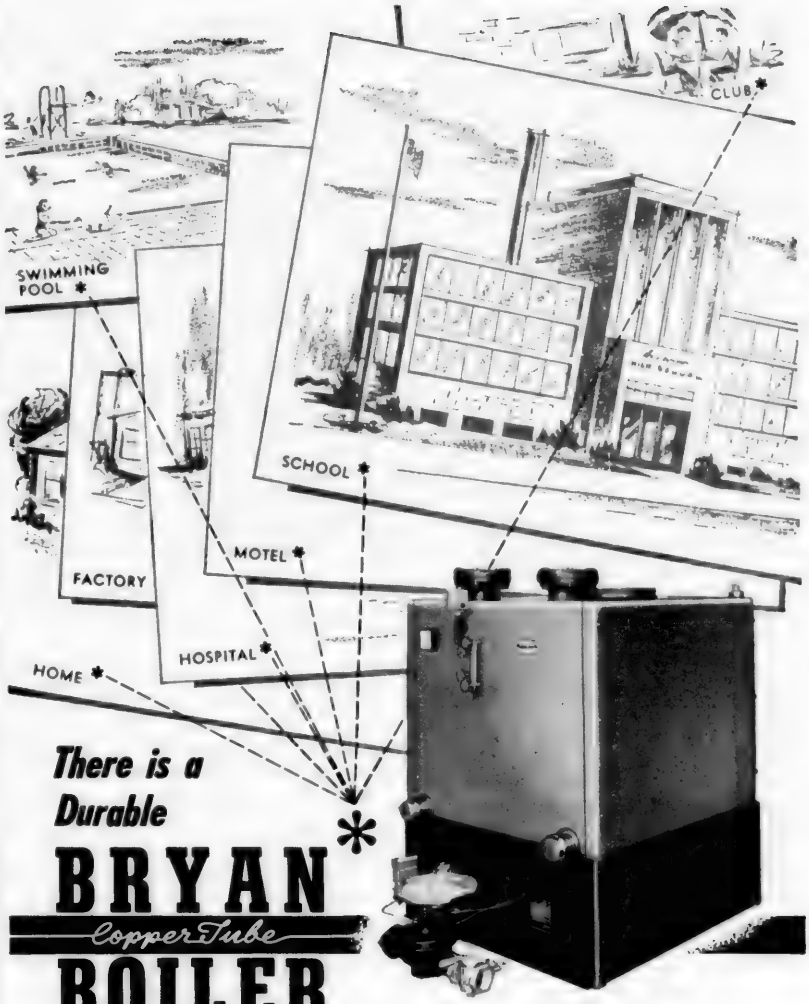
Adjustable
SPROCKET RIM
with Chain Guide



- Simplifies pipe layout
- Fits any size valve wheel
- Easy to install and operate
- Operates any valve from plant floor
- Time and money saving fixture
- No maintenance; first cost *only* cost
- Packed, completely assembled, one to a carton
- Hot galvanized, rust-proof chain available for all sizes
- Easy to follow instructions with each unit
- Your supplier carries complete stocks
- Write for new descriptive catalog sheet and prices

Babbitt STEAM SPECIALTY CO.

5 BABBITT SQUARE, NEW BEDFORD, MASS., U.S.A.



There is a Durable

BRYAN* *Copper Tube* BOILER

For every steam or water heating application up to 1,800,000 B.T.U. output.

Whether the plans on your boards are for a factory, apartment house, swimming pool or a modest radiant heat home, a detailed check on specifications will point to one of the many Bryan models covering low or high pressure steam, hot water boilers, or indirect water heaters.

The Bryan is a heavy duty, durable boiler made to deliver a lot of B.T.U's in a short period of time. Specially engineered for gas or oil heating, its high efficiency is complemented by years of trouble free service. Requires minimum floor space.

Bryan is the originator of the famous Bryan copper tubes. They are used in both direct and indirect heating units for fast action and elimination of scale deposits.

Bryan Gas Fired Boilers are designed and built to the requirements of the A.S.M.E. code and are also approved by the American Gas Association (A.G.A.)

Send For Technical Information • 2100 Chili Pike

BRYAN STEAM CORPORATION • Peru, Indiana

External adjustment
Visible calibrated dial

CAN BE USED THREE DIFFERENT WAYS

For operation as a

POSITIVE PRESSURE CONTROL
NEGATIVE PRESSURE (VACUUM) CONTROL

DIFFERENTIAL PRESSURE
(POSITIVE OR NEGATIVE PRESSURES)

This control employs a diaphragm which actuates a mechanism for opening or closing a mercury switch. The diaphragm separates two pressure chambers, one of which may be used for positive pressure; the other for negative (vacuum) operation or both chambers may be used to provide operation due to a difference in pressures between them.

OPERATING RANGE: 1.0" to 30.0" (H_2O)
MAXIMUM PRESSURE: 20 Psig

FIXED DIFFERENTIAL (SENSITIVITY)

When operating point is set at

LOW	MEDIUM	HIGH
0.6"	0.8"	1.0"

TYPES AVAILABLE

FULLY AUTOMATIC OPERATION: sp-st circuit opens on increase of pressure, vacuum or differential pressure; or sp-st circuit to open on decrease. (Available sp-dt or dp-st.)

SEMI-AUTOMATIC OPERATION (With Manual Reset): Available to operate automatically on decrease or increase.

FOR FURTHER DETAILS WRITE FOR BULLETIN PG

THE MERCOID CORPORATION
4211 BELMONT AVE., CHICAGO 41, ILL.
NEW YORK OFFICE: 205 EAST 42nd ST.
PHILADELPHIA OFFICE: 3137 N. BROAD ST.

warm air is discharged across the ceiling and exhausted at low level on the same side of the room. For cooling the operation is reversed and cold air is forced across the floor and exhausted at the ceiling line.

Research and development in the problem of noise, long associated with air conditioning, has resulted in new and quieter fans and blowers, improvements in duct insulation. One duct silencer, exhibited for the first time, resulted from a special research program. Another duct silencer, developed by a specialist in noise control for industry was designed especially for axial flow fans and the higher pressure systems.

• **NEW CONTROLS**—A pneumatically operated high velocity air valve eliminates the need for air motors and linkage mechanism in a rectangular high velocity air valve. A new wall thermostat, developed for electric heating, has its control knob exposed to both room temperature and radiant heat and is designed to sense and automatically compensate for changes in the comfort level. Another innovation was a radiant heat thermostat incorporating an accurate bellows operator while the outside surface of the instrument is heated through a resistor to approximately the temperature of the human body. Under the combined or individual influence of radiation, convection, or air temperature the bellows responds to actuate the control.

A sensitive control for warm air gas furnaces employs a tiny thermistor detector and transistorized modulator valve that acts directly on the burner but permits continuous air circulation. The control is designed for a control range of 55 to 85 deg F but does not replace the conventional thermostat which acts only as a high-limit cut-off.

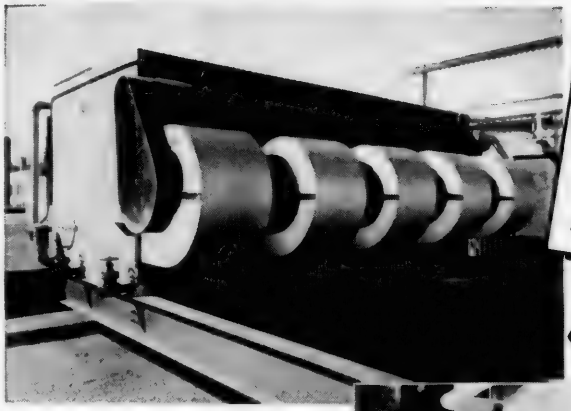
(Continued on page 148)

More than 500 New York area dealers, gathered at the Waldorf-Astoria Hotel, saw the introduction of 1959 residential and commercial air conditioning and heating equipment. Sponsored by York Wholesalers of Long Island City, L&M Distributors of New Rochelle, N. Y., and York-New Jersey Distributors of Jersey City, N. J., the meeting is said to have been the largest gathering of dealers in the history of York Corporation (Div. Borg-Warner) and one of the largest ever held in the industry.
Photo by Will Weissberg

a good team for steam

This Yarway team has scored high—over a million installed on all types of steam equipment. Stocked and sold by 270 Industrial Distributors. For free Steam Trap Book, write YARNALL-WARING CO., 104 Mermaid Ave., Philadelphia 18, Pa.

go YARWAY with confidence

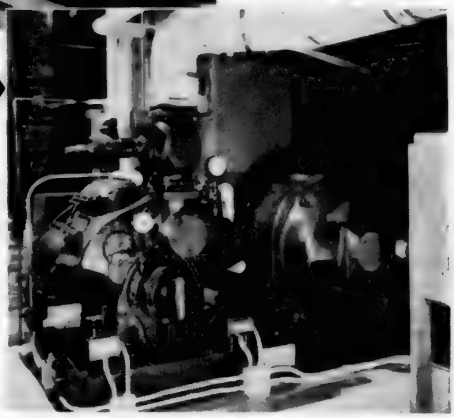


Vilter Report Card

Grade	Service Record
A	Efficient, alternating zone-load operation.
A	Exceptionally low operational cost.
A	Uninterrupted air conditioning service.
A	Smooth operation with minimum maintenance.

View of the Vilter VXF evaporative condenser located on the roof just outside the compressor room.

View of one of the two Vilter 8-cylinder VMC Freon compressors with a 100 h.p., 1175 r.p.m., part winding motor drive. These compressors are located on an upper floor, above an office.



Cool Thinking ... Cool Fun in Marquette University's Air Conditioned Brooks Memorial Union

Brooks Memorial Union is the hub of many Marquette University activities—professional meetings and conferences attracting a national audience, exciting school dances, excellent food facilities in the cafeteria, snack bar and private dining rooms. One key to its year-'round popularity and usefulness is the air conditioned comfort provided by the Vilter installation on this Milwaukee Campus.

To provide adequate air conditioning on a conservative appropriation and to minimize yearly operating expenses, the system was laid out to provide alternating zone-load cooling based on a "traffic flow" and usage pattern. During normal occupancy the entire Union is cooled. However, at peak loads only part of the conditioned space in Brooks Memorial is cooled at one time. As the peak occupancy load shifts from cafeteria and grill to the ballroom-conference room, the air conditioning is also shifted. Results of operating in this manner have been highly satisfactory.

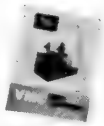
Vilter equipment furnished on this job included two 8-cylinder VMC compressors; VXF Freon evaporative condenser; Freon liquid receiver; heat exchanger, cooling coils, motors, and controls.

"Very satisfactory performance with only routine maintenance," is the praiseworthy comment by Marquette University officials.

Let Vilter help you with your air conditioning and refrigeration requirements.

Write for these helpful bulletins to: The Vilter Manufacturing Company Dept. G-804, 2217 S. First Street, Milwaukee 7, Wisconsin

Bulletin 631 Vilter Uni-Chiller



Bulletin 820 Vilter VMC Freon Compressors

Bulletin 732 VXF—VSC Evaporative Condensers

Vilter®

REFRIGERATION and AIR CONDITIONING

THE VILTER MANUFACTURING COMPANY, Milwaukee 7, Wisconsin

Air Units • Ammonia & Freon Compressors • Booster Compressors • Baudelot Coolers • Water & Brine Coolers • Blast Freezers • Evaporative & Shell & Tube Condensers • Pipe Coils • Valves & Fittings • Pakice & Polarflake Ice Machines

Above: View of a portion of 100-plus Aerovent "Model 53" Roof Ventilators installed on a West Coast auto assembly plant. Below: Closeup of a single Model 53 "low-level" unit. Standard and special-purpose units available in sizes 12" to 72" for capacities to 93,500 CFM. 3 types.

write for free Bulletin 600

Aerovent fans are rated in accordance with the standard test code for centrifugal and axial fans and conform with U.S.D.C. Comm. Std. CS178-51.

Aerovent
FAN COMPANY, INC.
ASH and BRANDT STS. • PIQUA, OHIO

Member Air-Moving and Conditioning Assn. (AMCA)

• **AIR FILTRATION IMPROVING**— One of the more active areas for development is air filtration. A plate type electronic air cleaner, patterned after units developed for U. S. atomic submarines, was offered for installation in the cold air return of any forced air heating or cooling system. It is activated by a power pack which plugs into any electrical outlet. An electrostatic air filter has a newly developed medium consisting of layers of woven plastic fiber held under spring tension, its inherent characteristics being maintained and increased by the flow of air. Another innovation was a filter made of specially developed synthetic fibers bonded in an interlocking pattern calculated to minimize surface loading and assure full depth filtration. It is treated with a germicide which not only kills bacteria but inhibits mold and mildew.

A new space filter is based on an original development for the Atomic Energy Commission to protect in-plant personnel and outdoor atmospheres against contamination by finely-divided radio-active particles. It is one of four new mechanical type filters by the same exhibitor.

The Exposition, as heretofore, was under the management of the International Exposition Co., of New York. E. K. Stevens, president, was manager of the event in Convention Hall.

BRI MEETING

will have half- and full-day technical workshops on windows, curtain wall sealants, and fasteners.

Half-day and full-day technical workshops on a wide variety of subjects will make up the program for the Building Research Institute's 8th Annual Meeting, held this year at the Penn-Sheraton Hotel, Pittsburgh, April 7 and 8.

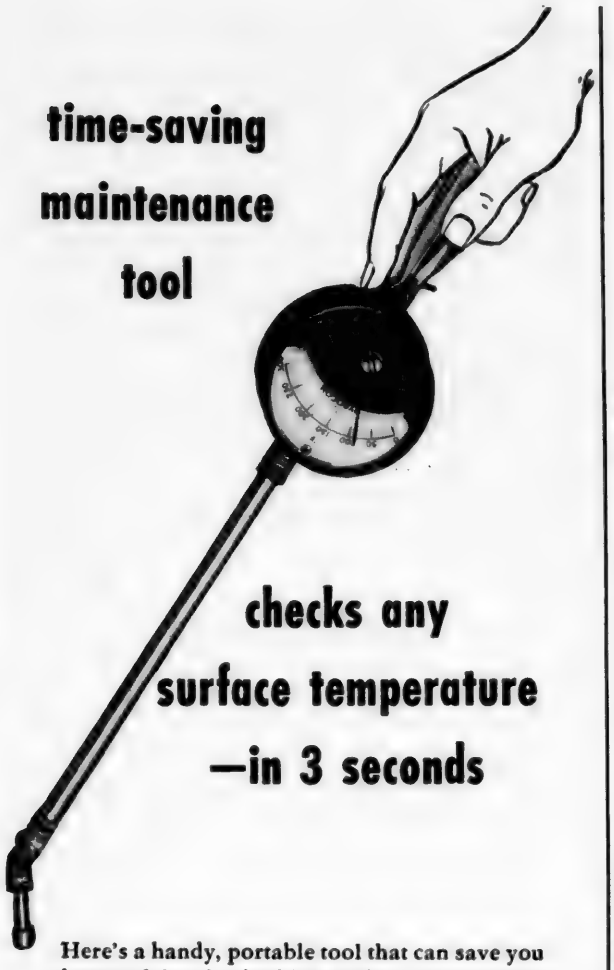
• **WINDOWS**—Two half-day sessions will be devoted to a Workshop on Windows, developed by BRI's Building Operation and Maintenance Study Group, in which design, selection, operation and maintenance of windows will be analyzed in terms of the problems encountered by building owners and maintenance men. Whether to have glass in future buildings at all, and if so how much; the comparative cost of maintenance and cleaning of various types of windows; height and width of windows in relation to blinds, drapes, heating, air conditioning and ventilation and a number of other pressing problems will be handed to a panel of 25 architects, engineers and manufacturers for discussion and solution.

• **CURTAIN WALLS**—In another workshop divided into two half-day periods, the newest developments in Sealants for Curtain Walls will be presented by the BRI Subcommittee on Sealants. Reports will include data on all of the newer types of sealants and gaskets developed since the BRI Conference on Adhesives and Sealants in December 1957, and also on new testing procedures for curtain wall tightness, both static and dynamic.

• **FASTENERS**—Mechanical Fasteners in Building, a new BRI activity, will begin with a half-day discussion of the newest and best mechanical fasteners for steel, concrete

(Concluded on page 150)

time-saving maintenance tool



checks any surface temperature —in 3 seconds

Here's a handy, portable tool that can save you hours of time in checking surface temperatures of steam traps, water lines, electric motors, bearings, etc.

The Alnor Pyrocon gives instant, accurate temperature readings of any surface: metallic or non-metallic, flat, curved—even revolving surfaces. It's a well-balanced instrument mounted in a sturdy case for protection against the usual hazards of on-the-job service. Jeweled movement is also heavy-duty, shock-resistant type that will withstand hard and continuous use...performing with laboratory accuracy.

A wide selection of thermocouples and extension arms assures its adaptation to your needs. Eight standard F. scale ranges are available up to 2000° F. Send for complete details contained in Bulletin 4257. Illinois Testing Laboratories, Inc., Room 514, 420 N. LaSalle St., Chicago 10, Ill.

PRECISION INSTRUMENTS FOR EVERY INDUSTRY

Alnor®

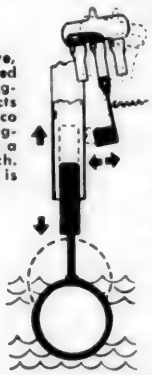
MERCURY-TO-MERCURY SWITCH
requires no service—contacts never pit, burn or corrode.
PERMANENT ALNICO MAGNET
links water level with electrical controls; prevents failure of mechanical linkages.
CORROSION-RESISTANT FLOAT
is made of 304 Stainless Steel for long, trouble-free service. Can also be made of special materials for extreme local conditions.
NO-SCALE FLOAT CHAMBER LINER
"flexes" off scale; prevents float "sticking".

Here's "Low Maintenance"

BOILER SAFETY

MAGNETROL

BOILER WATER LEVEL CONTROLS


A magnetic sleeve, raised and lowered within a nonmagnetic tube, attracts or repels an Alnico permanent magnet attached to a mercury switch. Basically, this is Magnetrol.

"Blow-down" the float chamber once-a-shift; inspect the switches once a month—that's all you have to do to keep a Magnetrol in tip-top *safe shape.* It's made that way. The secret is all in the simple magnetic operating principle *as pioneered and perfected by Magnetrol.*

Standard Magnetrol Units are available for pressures to 600 psi and temperatures to 750 F., for single or multi-stage control with as many as three separate switching actions. Also special units for more extreme requirements. For full details, mail coupon.

MAGNETROL, Inc.

MAGNETROL, INC., 2106 S. Marshall Blvd., Chicago 23, Ill.
Please send Catalog Section III with full information about Magnetrol Boiler Water Level Controls.
10

Name_____

Company_____

Address_____

City_____ Zone____ State_____

FOR LOW COST HEATING PLANT POWER-DRAFT AND INDUSTRIAL EXHAUSTING

Patent No. 2,722,372. Other Patents Pending.

...Specify

Quickdraft

★ NO MOTORS, FANS OR BEARINGS IN EXHAUST LINE ★ NEEDS NO STACKS ★ ACID RESISTING FINISHES ★ STATIC PRESSURE UP TO 60 INCHES

FOR HEATING PLANTS AND INCINERATORS, Quickdraft provides constant draft for efficient and economical combustion. It eliminates pulsating or chattering, puffing, smoking and sooting. Costly, tall and unsightly stacks are unnecessary.

FOR INDUSTRY, Quickdraft now offers from ¼-inch to 60-inches static pressure for exhausting corrosive gases, abrasives and paint spray . . . moving fine bulk materials and wastes.

FOR MOVING AIR . . . in or out of building through ducts . . . Quickdraft is outstanding.

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IMPORTANT NOTICE

For withstanding corrosive gases, all Quickdraft units are available in standard acid resisting vitreous enamel, No. 316 Stainless Steel, rigid plastics (P.V.C.) and with plastic and Fiberglas coatings.

Write for QUICKDRAFT ENGINEERING DATA on your application . . . today.

Quickdraft CORPORATION P. O. Box 87-O Canton 1, Ohio

and wood construction, and for attaching industrial roofing and siding

• **CRYSTAL BALL**—In two other unique program segments BRI members will hear the experts prognosticate the future of the building industry. Taking a "look to the future" will be Robert W. Dowling, noted New York financier and member of the Board of Equitable Life, who will present a speech on "The Investor's Attitude toward City Planning and Building Design of the Future." Prof. Burnham Kelly of Massachusetts Institute of Technology will make the first public report on the MIT studies just completed for ACTION, with particular stress on the trends in home building, prefabrication and mobile home construction that seem to be evident for the '60's. Internationally known architect Vincent G. Kling of New York will then take the rostrum to present the designer's ideas on the buildings we'll be living, working and playing in during the next decade.

• **MATERIALS RESEARCH**—In the realm of materials research, six prominent research directors will join in a panel discussion on "Research Plans for the '60's and their Potential Impact on the Buildings of 1970."

Additional program information and registration material may be obtained from Harold Horowitz, Technical Secretary, Building Research Institute, 2101 Constitution Ave., Washington 25, D. C.

PARIS MEETING

on heating, ventilating, and air conditioning set for May. Russians, Americans, Italians among speakers.

The Technical Institute of Buildings and Public Works, Paris, France, announced the convening on the 25, 26, 27, and 28th of May of its Conference on Heating, Ventilating and Air Conditioning. Among the topics are: *heating and ventilating of educational institutions*, with participants from Britain, the United States, Belgium, Poland, France, the Soviet Union, Hungary and Italy, each reporting on the techniques of his country.

Heating with gas will cover gas transmission and utilization, with special emphasis on the gas-fired boiler. A session on *radiators and convectors* will cover the latest researches in this field. Papers on the measurement of air pressure, damping of air-borne noise, injectors, intermittent heating, and several other subjects will be presented.

Information may be had by writing the Institut Technique du Batiment et des Travaux Publics, 6, rue Paul-Valery, Paris X 16°.

CORRECTION

In the article, "Solar Radiation on Walls Facing East and West," by Charles V. Cuniff, on the October, 1958 issue, data in the last two columns of Table 5, on page 88, were inadvertently switched. Values of percentage radiation appearing below the column heading "Fig. 11" are actually those that belong under the column heading "Fig. 12," and vice versa.

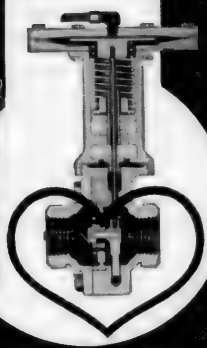
OPW JORDAN

self-operating

temperature control valve

- GUARANTEED DEAD END SHUT-OFF
- MORE ACCURATE REGULATION
- ELIMINATES NEED FOR PRESSURE REDUCING VALVE ON HIGH INLET PRESSURES

the different and improved way to control temperature



with the sliding gate and plate

the heart of the OPW-JORDAN Valve

No. 180

The unique basic design and exclusive features of this valve are responsible for its outstanding performance and long dependable service life. Durably constructed for hard, constant use, the compact, space saving, No. 180 offers the full advantage of accurate control with desired sensitivity of response.

For more facts, write for Bulletin J-180

JORDAN CORPORATION

INDUSTRIAL SALES DIVISION OF OPW CORPORATION

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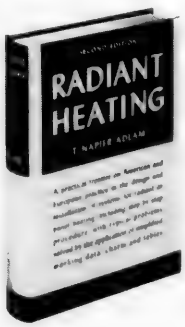
FOR THE MOST UP TO DATE MATERIAL ON

RADIANT HEATING



All you need to know about the design and installation of all types of radiant heating systems.

Step-by-step procedure, general information, design formulas and working data combine to give you the facts you need in designing and installing effective systems. All formulas have been reduced to the simplest terms. Typical problems are solved by the application of the easy-to-use charts and tables—without calculation.

504 Pages $6.00 337 Illustrations

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93 Worth St. New York 13, N. Y.

Elgo Ventilating Specialties

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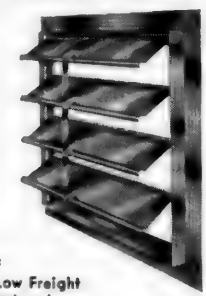
EXTRUDED ALUMINUM SHUTTERS



Shutters of modern design which give you ALL of these features: Lightweight, Full Weather Strip, Low Freight Cost, Easier installation, Concealed Pivot Pins, Rust and corrosion Proof and Natural aluminum finish with fluted frames.

Write for complete specifications.

Free Catalog

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2732 W. Warren Detroit 8, Michigan

The Porcupine Who Became Very Sharp!

Once upon a time ...

there was a porcupine who often appeared somewhat needled. He had been buying outmoded disposable media filters that were expensive to use and very difficult to install.

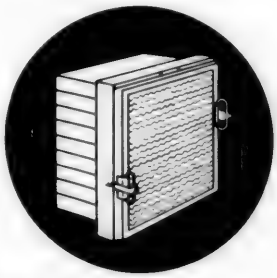
At first he felt it would be pointless to try the new, preformed Far-Air HP Filter which had become so popular, because of it's efficiency, economy, and convenience.

Then one day his friendly Far-Air man slipped a folded HP Filter right under his door. Mr. Porcupine got the point when he popped it open and realized how easy it would be to install. He specified HP filters because they solved his problem.

Now he's really sharp . . . he's sticking with them.

Moral:

Compare before you specify. See the new Far-Air HP Filter. Take quill in hand and fill out the coupon below.



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It's the . . . Sterlco®

THERMOTROL

for ACCURATE, INDEPENDENT ROOM TEMPERATURE CONTROL

STEAM or HOT WATER SYSTEMS

for modernization or new construction

CAN BE KEY LOCKED

for ...

HOSPITALS, APARTMENTS, OFFICES, HOTELS, SCHOOLS, MOTELS, INSTITUTIONS and PUBLIC BUILDINGS

- **COMPLETELY SELF-CONTAINED**
  Each Sterlco Thermotrol is a complete temperature control unit, easily installed in any two-pipe system in place of the manual valve. NO wiring or other external connections needed.
- **MODULATING CONTROL—NOT *on* AND *off***
  Each Sterlco Thermotrol provides steady, even control to each radiator the way YOU want it. Radiators in cold spots give off heat while those in warmer parts of the same room are automatically throttled down.
- **NO ELECTRICAL CONNECTIONS**
  No electric wiring, additional piping, or other connections are required with the Sterlco Thermotrol. Just as easily installed for modernization as for new construction.

FOR BUILDING MODERNIZATION

With a Sterlco Thermotrol on each radiator, stuffy overheated rooms, open windows, and excessive fuel bills are eliminated. You pay for only the heat you need . . . rooms are comfortably, evenly warm . . . occupants comfortable.

FOR NEW CONSTRUCTION

Here's modern ZONE CONTROL for radiant systems. The only modern solution to inefficient "on-off" valves and expensive, motorized valves.

STEAM HEATING IS MODERN, EFFICIENT and DEPENDABLE

Sterlco Products Distributed through

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STERLING, INC.

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CONDENSATION AND VACUUM PUMPS

HEATING SPECIALTIES

TEMPERATURE CONTROLS

Canadian Degree-Days for January, 1959*

City	January		Cumulative	
	1958-59	Normal	1958-59	Normal
Calgary, Alta.	1763	1530	5249	5190
Charlottetown, P. E. I.	1420	1460	4741	4310
Crescent Valley, B. C.	1282	1360	4563	4580
Edmonton, Alta.	2103	1780	5983	5850
Fort William, Ont.	2080	1830	6028	5790
Grande Prairie, Alta.	2331	1820	6642	6120
Halifax, N. S.	1228	1262	3966	3775
London, Ont.	1427	1320	4279	4000
Medicine Hat, Alta.	1794	1590	5127	5000
Moncton, N. B.	1462	1520	4990	4620
Montreal, P. Q.	1582	1590	4819	4630
North Bay, Ont.	1763	1710	5479	5330
Ottawa, Ont.	1643	1640	5065	4850
Penticton, B. C.	1140	1190	3779	3780
Prince George, B. C.	1712	1570	5407	5330
Quebec City, P. Q.	1670	1690	5498	5150
Regina, Sask.	2127	1940	6291	6090
St. John, N. B.	1434	1440	4850	4570
Saskatoon, Sask.	2215	1990	6439	6240
Timmins, Ont.	1970	1990	6197	6190
Toronto, Ont.	1341	1249	3937	3771
Vancouver, B. C.	824	890	2895	3010
Victoria, B. C.	775	800	2782	2770
Windsor, Ont.	1386	1220	3996	3660
Winnipeg, Man.	2173	1993	6323	6023

* These data are supplied through the courtesy of the Meteorological Division Air Service Branch, Department of Transport, Canada.
The Department reports a slight revision in the figure for December as published in last month's issue. Corrected figure is Crescent Valley, B. C., 1147.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available

WARM AIR HEATING SHORT COURSE—Annual Warm Air Heating and Air Conditioning Short Course, at Purdue University, sponsored by the Indiana Sheet Metal and Warm Air Heating Contractors, and the National Warm Air Heating and Air Conditioning Association, in cooperation with Purdue University. M. E. Ocker, conference coordinator, Division of Adult Education, Memorial Center, Purdue University, West Lafayette, Ind. . . . . **MARCH 16-19, 1959.**

WESTERN METAL EXPOSITION—Eleventh Western Metal Exposition and Congress, of the American Society for Metals, at the Pan-Pacific Auditorium and Ambassador Hotel, Los Angeles, Calif. R. Y. Bayless, assistant secretary of the Society, 7301 Euclid Ave., Cleveland 3, Ohio. . . . . **MARCH 16-20, 1959.**

1959 CORROSION SHOW—1959 Corrosion Show, held concurrently with the 15th annual conference of the National Association of Corrosion Engineers, at the Sherman Hotel, Chicago, Ill. T. J. Hull, executive secretary of the Association, 1061 M & M Bldg., Houston 2, Tex. . . . . **MARCH 17-19, 1959.**

1959 TRADE AND CONSUMER SHOW—The 1959 New England Home Show, a combined trade and consumer show, at the Commonwealth Armory, Boston, Mass. Sherman Expositions, 250 Boylston St., Boston, Mass. . . . . **MARCH 18-24, 1959.**

METEOROLOGICAL SOCIETY MEETING—175th National meeting of the American Meteorological Society, at the Shoreland Hotel, Chicago 15, Ill. K. C. Spengler, executive secretary of the Society, 3 Joy St., Boston 8, Mass. . . . . **MARCH 24-27, 1959.**

AMERICAN POWER CONFERENCE—The American Power Conference, sponsored by Illinois Institute of Technology, to be held at the Hotel Sherman, Chicago, Ill. R. D. Meade, conference coordinator, Illinois Institute of Technology, 3300 Federal St., Chicago 16, Ill. . . . . **MARCH 31-APRIL 2, 1959.**

GAMA MEETING—Annual meeting of the Gas Appliance Manufacturers Association, at the Americana Hotel, Bal Harbour, Fla. H. Leigh Whitelaw, managing director of the Association, 60 E. 42nd St., New York, N. Y. . . . . **APRIL 1-3, 1959.**

NUCLEAR CONGRESS—1959 Nuclear Congress, sponsored by the Instrument Society of America and coordinated by Engineers Joint Council, to be held in Cleveland, Ohio. Headquarters to be announced later. Burns & Roe, Inc., 160 West Broadway, New York 13, N. Y. ..... **APRIL 5-10, 1959.**

INDUSTRIAL AND COMMERCIAL GAS—Conference of Industrial and Commercial Gas Sales Section, American Gas Association, Warwick Hotel, Philadelphia, Pa. Ralbern Murray, Section Secretary, American Gas Association, 420 Lexington Ave., New York, N. Y. ..... **APRIL 7-9, 1959.**

OHI CONVENTION—37th annual convention of the Oil Heat Institute of America, Inc., at the Olympic Hotel, Seattle, Wash. Secretary, OHI, 500 Fifth Ave., New York 36, N. Y. ..... **APRIL 28-MAY 2, 1959.**

LPGA TRADE SHOW—5-Star Trade Show and convention of the Liquefied Petroleum Gas Association, at the Conrad Hilton Hotel, Chicago, Ill. Secretary of the Association, 11 S. LaSalle St., Chicago 3, Ill. ..... **MAY 3-6, 1959.**

NDHA CONVENTION—50th annual meeting of the National District Heating Association, Skytop Lodge, Skytop, Pa. Secretary-Treasurer, John F. Collins, Jr., 827 N. Euclid Ave., Pittsburgh 6, Pa. ..... **JUNE 1-4, 1959.**

ASTM MEETING—Annual meeting of the American Society for Testing Materials, at Chalfonte-Haddon Hall, Atlantic City, N. J. Secretary of the Society, 1916 Race St., Philadelphia 3, Pa. ..... **JUNE 21-26, 1959.**

ASHRAE MEETING—Annual meeting of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, at the Lake Placid Club, Lake Placid, N. Y. Secretary of the Society, 62 Worth St., New York 17, N. Y. ..... **JUNE 22-24, 1959.**

AIR POLLUTION CONTROL MEETING—Annual meeting of the Air Pollution Control Association, at the Hotel Statler, Los Angeles, Calif. H. M. Pier, executive secretary of the Association, 440 Fifth Ave., Pittsburgh 13, Pa. ..... **JUNE 22-26, 1959.**

ASSE MEETING—Annual meeting of The American Society of Sanitary Engineering, at the Mayflower Hotel, Washington, D. C. M. Mercury, treasurer-secretary of the Society, 4328 South Western Ave., Chicago 9, Ill. ..... **JULY 19-24, 1959.**

ISA INSTRUMENT-AUTOMATION EXHIBIT—14th annual Instrument-Automation Conference and Exhibit of the Instrument Society of America, at the International Amphitheatre, Chicago, Ill. H. S. Kindler, ISA, 313 Sixth Ave., Pittsburgh 22, Pa. ..... **SEPTEMBER 21-25, 1959.**

AGA CONVENTION—Annual convention of the American Gas Association, at the Conrad-Hilton Hotel, Chicago, Ill. C. S. Stackpole, managing director of the Association, 420 Lexington Ave., New York 17, N. Y. ..... **OCTOBER 5-7, 1959.**

ARI EXPOSITION—11th Exposition of the Air-Conditioning and Refrigeration Industry at Convention Hall, Atlantic City, N. J. Geo. S. Jones, Jr., managing director of Air-Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N. W., Washington 6, D. C. ..... **NOVEMBER 2-5, 1959.**

WARM AIR HEATING CONVENTION—Annual convention of the National Warm Air Heating and Air Conditioning Association, at the Chase Hotel, St. Louis, Mo. G. Boeddener, managing director of the Association, 640 Engineers Bldg., Cleveland 14, Ohio. ..... **DECEMBER 1-4, 1959.**

ASHRAE MEETING—Semi-annual meeting of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, and the 2nd Southwest Heating and Air-Conditioning Exposition, sponsored by ASHRAE, in Dallas, Tex. The meeting will be at the Baker and Adolphus Hotels, and the Exposition in the Memorial Auditorium. Secretary of the Society, 62 Worth St., New York 13, N. Y. ..... **FEBRUARY 1-4, 1960.**

CONGRESS ON OCCUPATIONAL HEALTH—13th International Congress on Occupational Health, first to be held in the Western Hemisphere, at the Waldorf Astoria Hotel, New York City. Dr. Leo Wade, organizing committee, 15 W. 51st St., New York 19, N. Y. ..... **JULY 25-29, 1960.**

How Do You Look At A Water Cooler?

They may *look* similar—all quench your thirst. How do you choose the one to specify? Viewed from any angle, your best bet is the *manufacturer's long-term reputation* for service and satisfaction.

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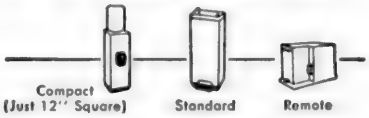

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For full details write for Catalog 59.

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*Advertiser appeared in preceding issue

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Sold at $12 per column inch.

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SALES ENGINEERS for well-known manufacturer of heat exchangers, pumps and allied equipment for heating and air-conditioning. We're looking for ambitious men who want to join us in going places fast. If you are a recent college graduate or have the equivalent training in engineering; experience in selling technical equipment; enjoy responsibility with monetary rewards and are willing to relocate, send your resume now including salary history and expectation. Address, Box 936, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

PRINTED FORMS available for immediate shipment. Heating & oil burner materials form, burner service record cards, service order forms, inspection information form, survey sheet and others. Also can supply BURNER SERVICE form in 8 part EZE SNAP with 3 carbons in each set, 1200 sets Imprinted with your name, address and telephone, only $20.40. Send for samples—no obligation. Write Dept. AC, Degree Day Systems, 39-30 58th St., Woodside 77, N. Y.

GRADUATE MECHANICAL ENGINEER: 5-10 years experience for design of industrial heating, air conditioning and fume control systems. Prefer industrial plant experience, but will accept up to 3 years consulting engineering as alternate. Send complete résumé of education, experience and salary requirement. Employment Department, Abbott Laboratories, North Chicago, Illinois.

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An established manufacturer with 25 years experience producing ventilating equipment is looking for manufacturer's agents in many sections of the country to sell their new line of industrial fans. The products include axial flow and tubeaxial fans, both direct and belt driven, and power roof ventilators.
Please reply Box 914, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

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If you are creative, and an innovator, with product design and development experience, you will want to investigate this opportunity.
Ours is a young aggressive company, the leader in a fast growing industry. Products of mechanical design and consumer appliance category. Send Résumé. Box 938, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

WANTED: Draftsman-Designer for heating, Air conditioning, & Electrical layout, for schools, Churches, commercial buildings and industrial applications. Must do neat and accurate work for a Consulting Engineering Organization in Southern Virginia. Submit complete résumé of experience and training, references, and salary desired. Profit sharing arrangement to successful applicant. Write Box 937, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

HUGHES PRINTING CO.
EAST STROUDSBURG, PA.

Below and on the following pages are given brief digests of the advertisements appearing in this month's issue. Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail the prepaid postcard to request further information from manufacturers.

The items appear in the same order as the advertisements to which they refer, to facilitate obtaining further information after reading an advertisement.

NOTE: All advertisements are digested here except those received too late for inclusion. The Index of Advertisers lists all the advertisements in this issue.

Use the postcard below for catalogs, new equipment and materials, as well as Ad-Digest items.

WELDING FITTINGS .....
from OTM Corporation are described in new Blue Ribbon catalog, said to be the most complete in the industry. It is available.
Inside Front Cover — Item 200

COMPLETE NEW TRAP LINE .....
from Armstrong Machine Works is designed and made especially for low pressure heating service. Advantages are: low cost, easy installation, internal check valves, years of service life, and minimum maintenance. Bulletin available.
Page 1 — Item 201

WROUGHT IRON .....
steam return lines made of new Byers' 4-D material are a formidable deterrent to steam condensate corrosion and its deleterious effects. Literature is available, also special report.
Page 5 — Item 202

AIR CONDITIONING EQUIPMENT .....
from The Governair Corp. is so basically flexible in design that it can be manufactured to fit almost any space and load requirement. Detailed information is available.
Page 7 — Item 203

FLUSH VALVES .....
from Coyne & Delaney Co. are providing a future of faultless service for the beautiful new Hopkins Hotel, adjacent to Hopkins Airport in Cleveland, Ohio. Information is available.
Page 9 — Item 204

SUPER-DRY REFRIGERANTS .....
are universally accepted for use as original or replacement charge. You can count on "Genetrons" for top performance. Information is available.
Page 11 — Item 205

HOT WATER BOILER .....
of the packaged automatic type has a unique inside story. More than two years of research by Orr & Sembower, Inc., went into the development of an internal circulation system that keeps temperature gradients low. Bulletin is offered.
Page 13 — Item 206

TROUBLE-FREE SOLENOID VALVES
from Alco Valve Co. are available for every refrigerant control application: liquid, suction, hot gas, brine, water, steam, or air. Compactly constructed of corrosion resistant materials to precision standards. Bulletin is available.
Page 15 — Item 207

LIGHTWEIGHT COPPER TUBE .....
is easy to install. Overhead work is easier with Anaconda copper tube. Use it for your next drainage installation. Information is available.
Page 15 — Item 208

DIAL THERMOMETERS .....
designed expressly for piping and duct work are available from Jas. P. Marsh Corp. For direct mounting or remote reading, they tilt or turn to any angle. Bulletin is offered.
Insert 17-18 — Item 209

HEAVY-DUTY FAN .....
featuring a perfected airfoil blade design presents new highs in quietness and efficiency. Clarage Fan Co. describes this fan in a new catalog, which is offered.
Page 19 — Item 210

PNEUMATIC CONTROL SYSTEM .....
serves varied uses at new wax plant. Johnson controls provide flexible, precise regulation of process steam, hot water and air conditioning, as well as of the comfort air conditioning, heating and ventilating systems. Condensed catalog is available.
Pages 20-21 — Item 211

REMOVABLE CORE GRILLES .....
are presented by Waterloo Register Co. Cores slip out easily and prevent damage to plaster or painted walls. Comprehensive catalog is offered.
Page 22 — Item 212

ONE-PIECE PIPE INSULATION .....
from Gustin-Bacon Mfg. Co. snaps quickly on the pipe or tubing. Its thermal efficiency rates at the top of all general purpose pipe insulations, and is permanent. Information is available.
Page 23 — Item 213

NEW MODELS, NEW SIZES .....
and new styling are features of Trane self-contained air conditioning units. Air or water cooled, they are easier to install and service. Information is available.
Pages 24-25 — Item 214

ROOF VENTILATORS .....
and all other air moving units manufactured by The Peerless Electric Co. must operate smoothly and quietly. Each one is electronically checked by dynamic balance while in actual operation. Catalogs are available.
Page 26 — Item 215

STEEL BOILERS .....
from Burnham Corp. heat Long Island's "Office building of the year." A complete line of Scotch-type and Scotch-type package boilers are also available. Literature is offered.
Page 27 — Item 216

ABSORPTION REFRIGERATION UNIT
provides all-year humidity control at low cost for Schick Inc. Gas-operated Carrier units can be the source of important savings for any client. Full details are available.
Pages 28-29 — Item 217

PACKAGED WATER CHILLER .....
from Frick Co. is compact, automatic, and easily installed. Available in 20 to 180 ton units. Bulletins are offered.
Page 30 — Item 218

UNITARY AIR CONDITIONERS .....
have been rated by Air Conditioning and Refrigeration Institute. Seal of certification is public's guide to confidence in the industry. Directory of participating manufacturers and explanatory booklet are offered.
Pages 32-33 — Item 219

AUTOMATIC REGULATING VALVES
have a costly down-time. The ad, by Spence Engineering Co., Inc., gives three tips for low maintenance of these valves. More information is offered in a bulletin which is available.
Page 34 — Item 220

HERE ARE FIVE .....
of the 18 reasons why it pays to pick Chrysler Airtemp liquid chillers: Floating power; direct drive; positive lubrication; crankcase heater; and sealed-in motor. Remainder of the reasons are available from the manufacturer.
Page 35 — Item 221

HOT PIPE PROTECTION .....
for underground lines is provided by the Tri-Sul-Ite 3-way protection system. These installations have proven to be the speediest, easiest and surest underground pipe protection. Complete literature is offered.
Page 36 — Item 222

INQUIRY CARD

Circle below item numbers on which you wish catalogs or further information

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Name .....

Title or Job Function .....

Firm .....

Nature of Firm's Business .....

Street .....

City .....**Zone** ....**State** .....

This card is void after June 1, 1959

ALL-IN-ONE BURNER .....
bolts to boiler front. Petro burner provides substantial savings in installation costs by the elimination of the boiler base and fire brick combustion chamber. Information is available.
Page 37 Item 223

WELL-ENGINEERED FAN .....
from Buffalo Forge Co. provides all the things you want for satisfactory air handling at moderate pressures. Every fan embodies the famous "Q" factor. Bulletin is available.
Page 39 Item 224

FOUR INDUSTRIAL HEATERS .....
from Dravo Corp. keep a 79,000 sq ft warehouse, with high roof areas and large access doors, warm during severest cold spells. Information on this, and other services and products of the company, is available.
Page 40 Item 225

HIGH VELOCITY UNITS .....
from Air Devices Inc. provide constant volume under all conditions. Exclusive feature assures precision control of air volume and temperature. Information is available.
Page 41 Item 226

INDUCTION MOTORS .....
of the repulsion-start type are offered by Wagner Electric Corp. They start heavy loads with ease, and stand up under long service. Bulletin is available.
Page 42 Item 227

COOLING TOWERS .....
from Halstead & Mitchell boast a twenty-year guarantee. Specially treated wood decking resists rotting, fungus attack, and algae which accumulates and obstructs air flow in most other towers. Information is available.
Page 43 Item 228

AIR DIFFUSERS .....
with built-in diffusing vanes control every cubic foot of air in any enclosure. Agitair diffusers have unequalled performance efficiency. Information is available.
Page 44 Item 229

CENTRIFUGAL PUMPS .....
as well as a complete line of standardized close coupled pumps and circulators are offered by Taco Heaters, Inc. Literature is available.
Page 45 Item 230

SHOWER CONTROL .....
from this manufacturer is completely recessed into the wall. The Recesso thermostatic shower mixing valve offers complete safety. Information is available.
Page 46 Item 231

SAFE, ECONOMICAL PREHEATING ..
of No. 6 fuel oil using boiler steam and auxiliary gas-generated steam is Idea No. 2 in a series from Davis Engineering Corp. Further information is offered.
Page 47 Item 232

IN THE TYPICAL LAYOUT .....
diagrammed in the ad, all-air high velocity units are teamed with Waterloo return air grilles to insure quiet, draftless, perfectly balanced air distribution. Information is available.
Page 48 Item 233

IN THE TYPICAL LAYOUT .....
diagrammed in the ad, Anemostat all-air high velocity units are teamed with return air grilles to insure quiet, draftless, perfectly balanced air distribution. Information is available.
Page 48 Item 234

IMPORTANT SERVICE LINES .....
in Owens-Illinois new Atlanta plant are controlled by Jenkins valves. It will pay you to have this important assurance when you specify your control valves. Information is available.
Page 49 Item 235

CENTRIFUGAL PUMPS .....
of the single stage, horizontally split-case type, from Chicago Pump Co., feature heavy shafts, minimum space requirements, and excellent operating efficiencies. Engineering data are available.
Page 50 Item 236

150-LB WELDING FITTINGS .....
from Nibco, Inc., offer twice the strength and twice the life of other fittings in this range. Installations are competitive. Catalog is offered.
Page 51 Item 237

CONTROL SYSTEMS .....
from The Powers Regulator Co. have kept pace with the demands of modern science and industry. From the birth of the atomic age in 1942 through the very latest reactor installations these controls have played a vital and dependable role. Information is available.
Pages 52-53 Item 238

CENTRIFUGAL PUMPS .....
manufactured by Dunham-Bush are non-overloading for all practical purposes. Complete specifications and Rapid Selection Chart are offered.
Page 54 Item 239

STORAGE WATER HEATER .....
in New York's Bronx County building has processed, in 27 years, 8½ million gallons of rust-free hot water at 140 deg F. Other copper lined heaters from Patterson-Kelley Co. will provide long maintenance-free operation for you. Data file is available.
Page 55 Item 240

QUALITY PUMPS .....
for quality systems are assured when you specify Buffalo double-suction centrifugal pumps for clear water installations. Long life, reliable operation are built in. Bulletin is offered.
Page 109 Item 241

REMOTE AIR CONDITIONERS .....
from McQuay, Inc., provide year-round comfort with thin-line design. They are ideal for multi-room buildings and are ultra-quiet in operation. Information is available.
Page 111 Item 242

INDUSTRIAL AIR FILTERS .....
from Research Products Corp. explode the notion that it costs less to buy replaceable filters and throw them away when dirty than to have permanent filters cleaned. Information is available.
Page 113 Item 243

UNIT VENTILATOR CONTROL .....
team, from Minneapolis-Honeywell, reacts fast to level the temperature changes common to high occupancy areas such as classrooms. Information is available.
Insert bet. 114-119 Item 244

CENTRALIZED CONTROL .....
is easier to design, install and operate with Honeywell's new Selectographic DataCenter which uses floor plan and system projection for more compact installation. Information is available.
Insert bet. 114-119 Item 245

ELECTRONIC AIR CLEANER .....
line, from Minneapolis-Honeywell, offers you a choice of three cell designs to match exact job requirements. Activated charcoal filters are also available. Information is offered.
Insert bet. 114-119 Item 246

CONDENSATE PUMPS .....
from Skidmore Corp. have mechanical shaft-seal and close-coupled design. They offer more capacity, more performance. Bulletins are available.
Page 119 Item 247

UNIVERSAL PUMPS .....
from Bell & Gossett Co. cover a range from 1 to 40 horsepower. Every circulation requirement of systems using water for heating and cooling can be satisfied. Engineering data are available.
Page 121 Item 248

FORCED DRAFT BURNERS .....
from Ray Burner Co. are factory assembled, compactly constructed, and fully automatic. Units are ready for application as complete combustion systems. Bulletin is offered.
Page 123 Item 249

AIR MIXING UNITS .....
from Buensod-Stacey, Inc., allow balancing of a building's dual duct system before it's built. Units can be pre-set at the factory for desired volume and guaranteed within plus or minus 5%. Information is available.
Page 125 Item 250

PACKAGED INDUSTRIAL FANS .....
featuring flat radial blade wheels are offered by The New York Blower Co. to cope with virtually any industrial air or material handling problem. Bulletins are available.
Page 127 Item 251

MOTOR CONTROL .....
from Allen-Bradley Co. is providing trouble-free performance for another new air conditioning system. Information is available.
Page 129 Item 252

SUBMERSIBLE SUMP PUMP .....
from Weil Pump Co. is safe, quiet, clean and dependable. Only the rich can afford a cheap sump pump. Booklet is offered.
Page 130 Item 253

FLEXIBLE DUCT CONNECTION .....
from Cain Mfg. Co. is prefabricated—simply pull out desired length from dispenser-type carton, roll into round duct or form into square duct. Information available.
Page 131 Item 254

HIGH VELOCITY AIR FILTERS .....
from Air Filter Corp. feature high efficiency, minimum resistance, no direct air passage and large dust holding capacity. Catalogs are available.
Page 131 Item 255

FIRST CLASS
PERMIT NO. 53
Sec. 34.9 P.L.&R.
NEW YORK, N. Y.

BUSINESS REPLY CARD
NO POSTAGE NECESSARY IF MAILED IN UNITED STATES

POSTAGE WILL BE PAID BY

AIR CONDITIONING, HEATING and VENTILATING
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NEW YORK 13, N.Y.

AD-DIGEST SERVICE

HEAVY DUTY BOILERS .....
are listed in Bryan Steam Corp.'s line for

ROOF VENTILATORS .....
from Aerovent Fan Co., Inc., fit every

PREFORMED FILTER .....
from Farr Co. is efficient, economical and

EASY-TO-INSTALL ..... aluminum roof ventilator is available from Loren Cook Co. Unit is shipped completely assembled, with integral conduit to facilitate wiring. Catalog and booklet, Ideas for Moving Air, are offered.
Page 131 Item 256

PACKAGED BOILERS ..... from Cleaver-Brooks ensure profits by eliminating costly waste of time building the boiler on the job. Units completely pre-engineered, factory tested, ready for hookup to service lines. Information is available.
Page 132 Item 257

INDUSTRIAL UNIT HEATERS ..... from Westinghouse's Sturtevant Division offer optimum Btu output, optimum air capacity and optimum versatility. The manfacturer makes every component. Catalog is available.
Page 133 Item 258

SIDEWALL DIFFUSER SELECTION ... is discussed in this ad by Barber-Colman Co. The company's diffusers and accessories are covered in an engineering data catalog which is available.
Pages 134-135 Item 259

NEW MOTOR OPERATOR ..... from Barber-Colman Co. is transistorized for proportional control. Electronically controlled device offers superior performance and low maintenance. Brochure is available.
Page 135 Item 260

YEAR-ROUND CONDITIONERS ..... from Tuck-aire Furnace Co. have filtered forced air gas furnaces in heating capacities from 60,000 to 250,000 Btu. Cooling capacities from 2 to 7½ tons. 24 counterflow or up-flow models. Air-cooled remote condensing units with matching evaporator coils. Information available.
Page 136 Item 261

FLEXIBLE HOSE ..... from The Flexaust Co. is adaptable for all kinds of fume and dust control and ventilation uses. It is durable, lightweight, and easy to install. Information is available.
Page 136 Item 262

CONTINUOUS RIDGE VENTILATOR .. converts a roof ridge to a quick-acting, giant air valve economically. Data book from The Burt Mfg. Co. supplies information on its complete line of modern roof ventilators.
Page 137 Item 263

ZONE-CONTROL VALVE ..... from Heat-Timer Corp. ensures comfort in each area of the home or building but eliminates burning of fuel to furnish unwanted heat. Contains built-in auxiliary switch which automatically starts circulator or burner when any valve is in open position. Brochure available.
Page 138 Item 264

FOR CONDENSING REFRIGERANTS .. Edward Engineering Corp. offers a simple, economical, air-cooled method that makes possible, for the first time, the elimination of fans, motors, cooling towers, noise and maintenance. Technical data are available.
Page 139 Item 265

FLEXIBLE AIR DUCT ..... from The Wiremold Co. is made with a flat metal spiral that mechanically locks to the fabric component. Two lengths join simply by screwing. Information is available.
Page 140 Item 266

COMBINATION BURNERS ..... are available for this company's industrial heaters and are interchangeable with single fuel burners. Lennox "Task matched" equipment controls and conditions air for industry. Engineering data are offered.
Page 140 Item 267

FORCED AIR HEATING ..... and ventilating units from Thermal Engineering Corp. were applied in a modern structure for the Burbank, Calif., Y. M C A. Detailed specifications are available.
Page 141 Item 268

INSULATION ADHESIVE ..... from St. Clair Rubber Co. is specially formulated, and offers 30% savings on labor cost, a permanent bond, and a neater job. A catalog sheet, as well as a sample, is available.
Page 141 Item 269

GAS UNIT HEATERS ..... from Reznor Mfg. Co. cost much less, Btu for Btu, than most other types of heating equipment. Completely automatic packaged units occupy absolutely no valuable floor space. Booklet, entitled "Modern Heating," is offered.
Page 141 Item 270

AIR FILTERS ..... for air conditioning and ventilating equipment, engines, compressors, or any device using air or liquids are available from Air-Maze Corporation. All-line catalog is offered.
Page 142 Item 271

INSTRUMENTS TO INDICATE ..... and record temperature, pressure and humidity are offered by Wekaler Instruments Corp. A condensed catalog is available and will show you the complete line.
Page 142 Item 272

VENTILATING BRICKS ..... and blocks in cast aluminum are an ideal air intake for unit air conditioners. According to Construction Specialties, Inc., they are neat, sturdy, economical and efficient. Catalog is offered.
Page 143 Item 273

ROTARY ROOF VENTILATORS ..... from Western Engineering and Mfg. Co. have lifetime guaranteed bearings. High, constant exhaust capacity is assured. Catalog is available.
Page 143 Item 274

EVAPORATIVE CONDENSER ..... bulletin describes Drayer-Hanson units that are hot-dip galvanized after fabrication. Primary coil surface is copper tubing.
Page 144 Item 275

ADJUSTABLE SPROCKET RIM ..... with chain guide from Babbitt Steam Specialty Co. provides safe operation of overhead valve wheel, and is easy to install and operate. Catalog sheet and prices available.
Page 145 Item 276

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every steam or water heating application up to 1.8 million Btu per hr output. Information is available.
Page 145 Item 277

LOW PRESSURE CONTROL ..... from The Mercoid Corporation can be used three different ways: Positive pressure control, negative pressure control, and differential pressure. Bulletin is available.
Page 146 Item 278

COOL THINKING, COOL FUN ..... are offered in Marquette University's air conditioned Brooks Memorial Union through use of equipment from The Vilter Mfg. Co. Literature is available.
Page 147 Item 279

IMPULSE STEAM TRAP ..... and a fine screen strainer, both manufactured by Yarnall-Waring Co. are a good team for steam. Steam trap book is available.
Page 147 Item 280

PORTABLE PYROMETER ..... manufactured by Illinois Testing Labs in a wide selection of thermocouples and extension arms assures adaptation to your needs. Eight scaled ranges are available up to 2000 deg F. Bulletin is available.
Page 149 Item 282

BOILER WATER LEVEL CONTROLS .. are reported by Magnetrol, Inc., to be the safest as well as simplest devices available. Operating life is almost unlimited. Catalog is available.
Page 149 Item 283

FAN ENGINEERING DATA ..... are offered in booklet published by Quick-draft Corp. which discusses low cost heating plant power-draft and industrial exhausting.
Page 150 Item 284

DIFFERENT AND IMPROVED ..... way to control temperature is provided in the OPW Jordan self-operating temperature control valve. Sliding gate and plate is the heart of this valve. Bulletin is available.
Page 151 Item 286

EXTRUDED ALUMINUM SHUTTERS .. from Elgo Shutter & Mfg. Co. are of modern design, light weight, fully weather-stripped, easier to install, and are rust and corrosion proof. Complete specifications are available.
Page 151 Item 287

ROOM TEMPERATURE CONTROL .... from Sterling, Inc. for all types of buildings provides accurate and independent control on steam or hot water systems. A modulating control, it is completely self contained, has no electrical connections. Information is available.
Page 152 Item 288

WATER COOLERS ..... may all look similar and quench your thirst. In specifying, your best bet is the manufacturer's long term reputation for service and satisfaction. Since 1889, Cordley has been the first name in drinking water coolers. Catalog is offered.
Page 153 Item 289

ONLY A FEW ..... seconds' time is required to insert cartridges in the efficient and high capacity multiple cartridge filter-drier manufactured by Henry Valve Co. Information is offered.
Inside Back Cover Item 290

SAFETY RELIEF VALVES ..... for hot water space heating boilers are available from McDonnell & Miller, in a more complete line. These valves introduce new safety standards of their own. New bulletin is offered.
Back Cover Item 291

INQUIRY CARD

Circle below item numbers on which you wish catalogs or further information

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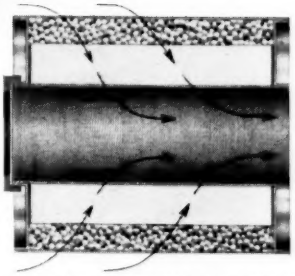
875-CMS DRI-COR® Filter-Drier Cartridges for these new driers are self-sealing and self-positioning. It requires only a few seconds to insert the cartridges into the drier shell, resulting in a minimum of exposure to the atmosphere and loss of cartridge drying capacity. Thus, the cartridges are clean, dry and complete—due to efficient design and split second handling.

The refrigerant flows uniformly over the total cartridge surface, through the desiccant bed and each filter core. This results in maximum moisture and acid removal with high flow capacity and low pressure drop.

These brass driers contain from two to five cartridges and are available with connection sizes ranging from 1⅛" to 2⅛" O.D. Solder.



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HENRY VALVE CO.

MELROSE PARK, ILLINOIS (Chicago Suburb)
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HENRY VALVE CO. CONTROLLING FLOW SINCE 1914

The family has grown!

...in size...in importance

The addition of a new and finer McDonnell 2-inch valve rounds out a line of safety relief valves for hot water space heating boilers that fulfills a vital need supremely well.

To know how true this is go back over the modern history of relief valves. With the rapid increase in closed systems, casualty companies, the National Board, and others concerned with boiler and heater safety went to work . . . and the net result was today's commendable A.S.M.E. Boiler Code calling for certified Btu-rated relief valves.

Closely following this work, McDonnell & Miller developed the first of all Btu-rated relief valves. They were not only first into the field; they are still first. They not only conform to the letter of the code; they go beyond this: *introduce new standards of their own.*

For Hot Water Space Heating Boilers

McDonnell Valve No.	Boiler Size Btu./hr.	Opening Pressure	Inlet	Outlet
230-¾ IN.-30	303,000	30 lbs.	¾"	¾"
240-¾ IN.-30	513,000	30 lbs.	¾"	1"
230-1 IN.-30	743,400	30 lbs.	1"	1"
240-1 IN.-30	910,000	30 lbs.	1"	1¼"
230-1½ IN.-30	1,025,100	30 lbs.	1½"	1½"
240-1½ IN.-30	1,560,000	30 lbs.	1½"	2"
240M-3	2,313,000	30 lbs. 36 lbs.	2"	1" 2"
240M-4	2,710,000	30 lbs. 36 lbs.	2"	1¼" 2"
240-2 IN.-30*	3,130,000	30 lbs.	2"	2½"
240-2 IN.-36*	3,550,000	36 lbs.	2"	2½"

*Recommended installation: 36 lb. opening valve, with smaller auxiliary valve set at 30 lbs. for thermal expansion.

New Bulletin P-33 gives up-to-the-minute facts

- A new bulletin shows why and how the entire rated capacity of McDonnell Relief Valves is obtained without diaphragms or other auxiliary lifting devices.
- It shows how this operation—this operation so basic to safety—is ideally accomplished by using specially calibrated "low rate" springs, matched to disc area to give smooth precise lift and tight closure.
- It explains the widely adopted McDonnell principle of progressive settings that keeps discharge in step with function . . . small valve relieving normal expansion; large stand-by valve ready for the emergency.

These and many more significant facts are covered in the bulletin. Note the accompanying table listing a valve for practically every boiler—McDonnell quality straight across the board.

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